

WEST Search History

[Hide Items](#)[Restore](#)[Clear](#)[Cancel](#)

DATE: Friday, December 09, 2005

Hide?	<u>Set</u> <u>Name</u>	<u>Query</u>	<u>Hit</u> <u>Count</u>
		<i>DB=USPT; PLUR=YES; OP=OR</i>	
<input type="checkbox"/>	L1	6667158.pn.	1
		<i>DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR</i>	
<input type="checkbox"/>	L2	(h-1 or h1 or Hn or h-n or N-terminal or nterminal).ti,ab,clm.	30541
<input type="checkbox"/>	L3	L2 and (botulinum or botulism or botulin or botox or dysport or clostridia or clostridial or clostridium)	309
<input type="checkbox"/>	L4	L2 and (botulinum or botulism or botulin or botox or dysport or clostridia or clostridial or clostridium).ti,ab,clm.	68
<input type="checkbox"/>	L5	L4 and (peptide or epitope or mapping or mapped or map or polypeptide or antigenic or monoclonal or hybridoma or mab or moab or antibodies or antibody or scfv or humanized).ti,ab,clm.	51

END OF SEARCH HISTORY

YSTEM:OS - DIALOG OneSearch

File 155:MEDLINE(R) 1951-2005/Nov 15

(c) format only 2005 Dialog

*File 155: Completed records will cease to update on 16 November. Please see HELP NEWS 154 for details.

File 5:Biosis Previews(R) 1969-2005/Nov W2

(c) 2005 BIOSIS

File 73:EMBASE 1974-2005/Nov 21

(c) 2005 Elsevier Science B.V.

File 156:ToxFile 1965-2005/Nov W2

(c) format only 2005 Dialog

File 654:US Pat.Full. 1976-2005/Nov 17

(c) Format only 2005 Dialog

File 440:Current Contents Search(R) 1990-2005/Nov 21

(c) 2005 Inst for Sci Info

File 349:PCT FULLTEXT 1979-2005/UB=20051117,UT=20051110

(c) 2005 WIPO/Univentio

File 144:Pascal 1973-2005/Nov W2

(c) 2005 INIST/CNRS

File 358:Current BioTech Abs 1983-2005/Oct

(c) 2005 DECHEMA

File 185:Zoological Record Online(R) 1978-2005/Nov

(c) 2005 BIOSIS

File 453:Drugs of the Future 1990-2005/OCT

(c) 2005 Prous Science

*File 453: Chemical structure searching (CSS) now enabled in this file. And the file is updating regularly. See HELP NEWS 453.

File 342:Derwent Patents Citation Indx 1978-05/200573

(c) 2005 Thomson Derwent

File 203:AGRIS 1974-2005/Aug

Dist by NAL, Intl Copr. All rights reserved

File 35:Dissertation Abs Online 1861-2005/Oct

(c) 2005 ProQuest Info&Learning

File 98:General Sci Abs/Full-Text 1984-2004/Dec

(c) 2005 The HW Wilson Co.

File 340:CLAIMS(R)/US Patent 1950-05/Nov 17

(c) 2005 IFI/CLAIMS(R)

*File 340: The 2005 reload is online as of October 17, 2005. See HELP NEWS 340 for details.

File 143:Biol. & Agric. Index 1983-2005/Sep

(c) 2005 The HW Wilson Co

File 621:Gale Group New Prod.Annou.(R) 1985-2005/Nov 21

(c) 2005 The Gale Group

File 348:EUROPEAN PATENTS 1978-2005/Nov W01

(c) 2005 European Patent Office

File 94:JICST-EPlus 1985-2005/Sep W3

(c)2005 Japan Science and Tech Corp(JST)

File 50:CAB Abstracts 1972-2005/Oct

(c) 2005 CAB International

File 10:AGRICOLA 70-2005/Nov

(c) format only 2005 Dialog

File 16:Gale Group PROMT(R) 1990-2005/Nov 21

(c) 2005 The Gale Group

Set Items Description

--- -----

Cost is in DialUnits

? ds

Terminal set to DLINK

? t s3/9/16 18 19 24 27 28 30 49

erwent Accession: 2004-440365

Antibodies against type a botulinum neurotoxin

Inventor: Bavari, Sina, INV

Melendez, Edna R., INV

Lebeda, Frank, INV

Correspondence Address: ATTN: MCMR-JA (Elizabeth Arwine- PATENT ATTY) U. S.
Army Medical Research and Materiel Command, Staff Judge Advocate
Office 504 Scott Street, Fort Detrick, MD, 21702-5012, US

	Publication Number	Kind	Date	Application Number	Filing Date
Main Patent	US 20040110284	A1	20040610	US 2003655450	20030904
Division	US 6667158			US 99465276	19991216
Provisional				US 60-112632	19981217

Fulltext Word Count: 12791

Abstract:

Antibodies for binding epitopes of BoNT /A and hybridomas which produce such antibodies are described. The antibodies of the present invention can be used in a method for detecting BoNT /A in a sample and/or in a method for purifying BoNT /A from an impure solution. In addition, the antibodies can be used for passive immunization against BoNT /A intoxication or as intoxication therapy. Another aspect of the invention is a kit for...

Summary of the Invention:

[0001] Anaerobic bacterium *Clostridium botulinum* produces seven immunologically distinct but structurally similar botulinum neurotoxins (BoNTs) designated BoNT/A-G...

...0002] Following synthesis, highly active neurotoxin generated by proteolytic cleavage of the CNTs (*clostridial*

Exemplary or Independent Claim(s):

- ...4. A continuous hybridoma cell line having deposit accession number ATCC PTA-971, and clones thereof, which cell line produces monoclonal antibody to BoNT /A...
- ...5. A continuous hybridoma cell line having deposit accession number ATCC PTA-969, and clones thereof, which cell line produces monoclonal antibody to BoNT /A...
- ...6. A continuous hybridoma cell line having deposit accession number ATCC PTA-970, and clones thereof, which cell line produces monoclonal antibody to BoNT /A...
- ...7. A monoclonal antibody which binds an epitope comprising amino acids 1150-1289 of BoNT /A...
- ...8. A monoclonal antibody which binds an epitope comprising amino acids 1157-1181 of BoNT /A...
- ...9. A monoclonal antibody which binds an epitope comprising amino acids 1230-1253 of BoNT /A...
- ...10. A monoclonal antibody which binds an epitope comprising 1157-1253 of BoNT /A...
- ...14. A method for detecting BoNT /A said method comprising: (i) incubating a sample with an effective amount of at least one monoclonal antibody against BoNT /A, under conditions which allow the formation of an antibody- BoNT /A complex; and (ii) detecting the antibody- BoNT /A complex whe

Antibodies against type a botulinum neurotoxin
; CONTACTING A SAMPLE WITH THE MONOCLONAL ANTIBODY 6B2-2 PRODUCED BY ATCC
PTA-969 HYBRIDOMA AND ISOLATING THE IMMUNOLOGICAL COMPLEX FORMED BETWEEN
THE BONT /A IN THE SAMPLE AND THE MONOCLONAL ANTIBODY.

Inventor: Bavari, Sina, Frederick, MD

Torres Melendez, Edna R., Frederick, MD

Lebeda, Frank J., Phurmont, MD

Assignee: The United States of America as represented by the Secretary of
the Army(06), Washington, DC

U S of America Army Secretary of (Code: 86528)

Examiner: Smith, Lynette R. F. (Art Unit: 165)

Assistant Examiner: Zeman, Robert A.

Combined Principal Attorneys: Arwine, Elizabeth; Harris, Charles H.

	Publication Number	Kind	Date	Application Number	Filing Date
	-----	--	-----	-----	-----
Main Patent	US 6667158	A	20031223	US 99465276	19991216

Fulltext Word Count: 10418

Abstract:

Antibodies for binding epitopes of BoNT /A and hybridomas which produce such antibodies are described. The antibodies of the present invention can be used in a method for detecting BoNT /A in a sample and/or in a method for purifying BoNT /A from an impure solution. In addition, the antibodies can be used for passive immunization against BoNT /A intoxication or as intoxication therapy. Another aspect of the invention is a kit for...

11838458 PMID: 9097417

Epitope regions in the heavy chain of Clostridium botulinum type E neurotoxin recognized by monoclonal antibodies.

Kubota T; Watanabe T; Yokosawa N; Tsuzuki K; Indoh T; Moriishi K; Sanda K ; Maki Y; Inoue K; Fujii N

Department of Microbiology, Sapporo Medical University, Japan.

Applied and environmental microbiology (UNITED STATES) Apr 1997, 63 (4) p1214-8, ISSN 0099-2240 Journal Code: 7605801

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Subfile: INDEX MEDICUS

Seventeen monoclonal antibodies (MAbs) were previously established against the heavy chain (Hc) of botulinum type E neurotoxin in BALB/c mice immunized with the type E toxoid. Five MAbs (LE15-5, LE34-6, EK19-7, EK21-4, and AE27-9) showed toxin-neutralizing activity in mice. Two of the five MAbs, EK19-7 and EK21-4, recognized the regions located at amino acid positions 731 to 787 and 811 to 897, respectively. One of the remaining three antibodies (LE34-6) reacted with the amino acid sequence VIKAIN, at amino acid positions 663 to 668, closed by the ion channel-forming domain. It is suggested that the ion channel-forming domain may also be associated with the blocking of acetylcholine release. Furthermore, the amino acid sequence YLTHMRD within 30 residues of the C-terminal region of the Hc component seemed to be recognized by LE15-5. It has been reported that the binding domain of the type E toxin is located on the C-terminal half of the Hc component. Therefore, the neutralizing activity of LE15-5 antibody may be attributed to its ability to block the binding of neurotoxin to the receptor of target cells.

Descriptors: *Botulinum Toxins--immunology--IM; * Clostridium botulinum --immunology--IM; *Epitopes--genetics--GE; Amino Acid Sequence; Animals; Antibodies, Bacterial--immunology--IM; Antibodies, Monoclonal --immunology --IM; Botulinum Toxins--genetics--GE; Clostridium botulinum --genetics --GE; Epitope Mapping; Epitopes--immunology--IM; Mice; Mice, Inbred BALB C; Molecular Sequence Data

CAS Registry No.: 0 (Antibodies, Bacterial); 0 (Antibodies, Monoclonal); 0 (Botulinum Toxins); 0 (Epitopes); 0 (botulinum toxin type E)

Record Date Created: 19970709

Record Date Completed: 19970709

3/9/19 (Item 19 from file: 155)

DIALOG(R) File 155:MEDLINE(R)

(c) format only 2005 Dialog. All rts. reserv.

11792031 PMID: 9041392

Sensitive assay for measurement of antibodies to Clostridium botulinum neurotoxins A, B, and E: use of hapten-labeled-antibody elution to isolate specific complexes.

Doellgast G J; Brown J E; Koufman J A; Hatheway C L

Department of Biochemistry, Bowman Gray School of Medicine, Winston-Salem, North Carolina 27157-1016, USA. gdoellga@bgsu.edu

Journal of clinical microbiology (UNITED STATES) Mar 1997, 35 (3) p578-83, ISSN 0095-1137 Journal Code: 7505564

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

07810 Endospore-forming Gram-Positives

3/9/78 (Item 11 from file: 5)

DIALOG(R) File 5:Biosis Previews(R)

(c) 2005 BIOSIS. All rts. reserv.

0007962779 BIOSIS NO.: 199242065670

PROPERTIES OF MONOCLONAL ANTIBODIES AGAINST CLOSTRIDIUM - BOTULINUM
TYPE A NEUROTOXIN

AUTHOR: FINCH S G (Reprint); HALLIS B; SHONE C C

AUTHOR ADDRESS: DIV BIOLOGICS, CENTRE APPLIED MICROBIOL RES, PORTON DOWN,
SALISBURY, WILTS SP4 0JG, UK**UK

JOURNAL: Journal of Applied Bacteriology 71 (6): pXXI 1991

CONFERENCE/MEETING: ANNUAL GENERAL MEETING AND 60TH ANNIVERSARY SUMMER
CONFERENCE OF THE SOCIETY FOR APPLIED BACTERIOLOGY, BRISTOL, ENGLAND, UK,
JULY 15-19, 1991. J APPL BACTERIOL.

ISSN: 0021-8847

DOCUMENT TYPE: Meeting

RECORD TYPE: Citation

LANGUAGE: ENGLISH

DESCRIPTORS: ABSTRACT PROTEINS ANTIGENIC SITES NERVE BINDING

DESCRIPTORS:

MAJOR CONCEPTS: Biochemistry and Molecular Biophysics; Immune System--
Chemical Coordination and Homeostasis; Infection; Nervous System--
Neural Coordination; Toxicology

BIOSYSTEMATIC NAMES: Endospore-forming Gram-Positives--Eubacteria,
Bacteria, Microorganisms

COMMON TAXONOMIC TERMS: Bacteria; Eubacteria; Microorganisms

CONCEPT CODES:

00520 General biology - Symposia, transactions and proceedings

10010 Comparative biochemistry

10054 Biochemistry methods - Proteins, peptides and amino acids

10064 Biochemistry studies - Proteins, peptides and amino acids

10068 Biochemistry studies - Carbohydrates

10506 Biophysics - Molecular properties and macromolecules

15002 Blood - Blood and lymph studies

17506 Muscle - Pathology

20504 Nervous system - Physiology and biochemistry

20506 Nervous system - Pathology

22501 Toxicology - General and methods

34504 Immunology - Bacterial, viral and fungal

36002 Medical and clinical microbiology - Bacteriology

BIOSYSTEMATIC CODES:

07810 Endospore-forming Gram-Positives

3/9/83 (Item 16 from file: 5)

DIALOG(R) File 5:Biosis Previews(R)

(c) 2005 BIOSIS. All rts. reserv.

0006475898 BIOSIS NO.: 198937053647

MONOCLONAL ANTIBODIES AGAINST HEAVY AND LIGHT CHAINS OF CLOSTRIDIUM -
BOTULINUM TYPE A NEUROTOXIN

AUTHOR: EVENSON M L (Reprint); TEPP W H; DASGUPTA B R

AUTHOR ADDRESS: UNIV WIS, MADISON, WIS, USA**USA

JOURNAL: Abstracts of the Annual Meeting of the American Society for
Microbiology 89 p64 1989

CONFERENCE/MEETING: 89TH ANNUAL MEETING OF THE AMERICAN SOCIETY FOR
MICROBIOLOGY, NEW ORLEANS, LOUISIANA, USA, MAY 14-18, 1989. ABSTR ANNU MEET
AM SOC MICROBIOL.

ISSN: 0094-8519
DOCUMENT TYPE: Meeting
RECORD TYPE: Citation
LANGUAGE: ENGLISH
DESCRIPTORS: ABSTRACT
DESCRIPTORS:

MAJOR CONCEPTS: Biochemistry and Molecular Biophysics; Immune System--
Chemical Coordination and Homeostasis; Infection; Toxicology

BIOSYSTEMATIC NAMES: Endospore-forming Gram-Positives--Eubacteria,
Bacteria, Microorganisms

COMMON TAXONOMIC TERMS: Bacteria; Eubacteria; Microorganisms

CONCEPT CODES:

00520 General biology - Symposia, transactions and proceedings
10064 Biochemistry studies - Proteins, peptides and amino acids
22501 Toxicology - General and methods
31000 Physiology and biochemistry of bacteria
34502 Immunology - General and methods
34504 Immunology - Bacterial, viral and fungal
36002 Medical and clinical microbiology - Bacteriology

BIOSYSTEMATIC CODES:

07810 Endospore-forming Gram-Positives

3/9/94 (Item 5 from file: 73)

DIALOG(R) File 73:EMBASE

(c) 2005 Elsevier Science B.V. All rts. reserv.

05648216 EMBASE No: 1994050477

Antagonism of the intracellular action of botulinum neurotoxin type A
with monoclonal antibodies that map to light-chain epitopes

Di Bello I.C.; Poulain B.; Shone C.C.; Tauc L.; Dolly J.O.

Department of Biochemistry, Imperial Sci., Technology/Med. Coll., South
Kensington, London SW7 2AY United Kingdom

European Journal of Biochemistry (EUR. J. BIOCHEM.) (Germany) 1994,
219/1-2 (161-169)

CODEN: EJBCA ISSN: 0014-2956

DOCUMENT TYPE: Journal; Article

LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

mAbs were produced in mice against highly purified, renatured light chain (LC) of botulinum neurotoxin A (BoNT A) that was immobilised on nitrocellulose to avoid the undesirable use of toxoids. Subcutaneous implants of relatively high amounts (up to 10 mug each) of LC allowed its slow release into the systemic circulation and, thus, yielded much higher antibody titres against the underivatized antigen than had hitherto been obtained by conventional immunization. Seven stable hybridoma cell lines were established which secrete mAb of IgGinf 1 and IgG(2b) subclasses reactive specifically with BoNT A and LC, in native and denatured states, without showing any cross-reactivity with types B, E, F or tetanus toxin. The pronounced reactivities of three mAbs towards refolded LC or intact toxin, observed in immunobinding and precipitation assays, relative to that seen in Western blots imply a preference for conformational epitopes. Though mAbs 4, 5 and 7 failed to neutralize the lethality of BoNT in vivo, administration intraneurally of mAb7 prevented the inhibition of transmitter release normally induced by subsequent extracellular administration of BoNT A. Notably, the latter mAb reacted with a synthetic peptide corresponding to amino acids 28-53 in the N-terminus of the LC, a highly conserved region in Clostridial neurotoxins reported to be essential for maintaining the tertiary structure of the chain. Most importantly, when mAbs 4 or 7 were microinjected inside ganglionic neurons

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Subfile: INDEX MEDICUS

The measurement of chicken and human antibodies to *Clostridium botulinum* neurotoxins A, B, and E was accomplished by affinity isolation of complexes containing these antibodies. By this approach, a mixture of toxin with the test antibody, fluoresceinated antibody, and enzyme (Russell's viper venom factor X activator)-labeled antibody is allowed to form a complex in solution phase. This complex is then bound to a matrix containing antiluorescein antibody. All components not bound to the matrix are washed off, and the complex is isolated intact by elution with fluorescein, which competes with the complex for binding to the antiluorescein matrix. The eluted complex is then bound to a matrix which specifically binds the test antibody (anti-chicken immunoglobulin Y [IgY] or anti-human IgG), and the bound complex is measured by using the enzyme label. Using this approach, we were able to measure as little as 1 ng of specific antibody per ml from affinity-isolated, monospecific chicken antibody preparations and to measure antibody specifically from IgY fractions of monospecific chicken antibody preparations. Human antibodies from subjects immunized with pentavalent toxoid preparations were detectable at dilutions as great as 24,300-fold, and undiluted serum from most control subjects showed no measurable antibody. Antibody was also measured in 65 subjects who were receiving preparations of neurotoxin A (BOTOX) for the treatment of spastic disorders. Eighteen of them had toxin-specific antibody reactive with toxin B, and two of them had toxin-specific antibody reactive with toxin A. The two patients having antibody to toxin A were refractory to treatment with this toxin. This approach of isolation of hapten-labeled immune complexes under nondenaturing conditions with hapten is broadly applicable to the specific measurement of antibodies present at very low concentrations in serum.

Tags: Research Support, U.S. Gov't, Non-P.H.S.

Descriptors: *Antibodies, Bacterial--analysis--AN; *Bacteriological Techniques; *Botulinum Toxins--immunology--IM; *Immunoassay--methods--MT; Animals; Antibodies, Bacterial--blood--BL; Antibodies, Monoclonal ; Antigen-Antibody Complex--isolation and purification--IP; Bacteriological Techniques--statistics and numerical data--SN; Botulinum Toxin Type A --administration and dosage--AD; Botulinum Toxin Type A--immunology--IM; Chickens; Evaluation Studies; Fluorescein; Fluoresceins; Haptens; Humans; Immunization; Immunoassay--statistics and numerical data--SN; Sensitivity and Specificity

CAS Registry No.: 0 (Antibodies, Bacterial); 0 (Antibodies, Monoclonal); 0 (Antigen-Antibody Complex); 0 (Botulinum Toxin Type A); 0 (Botulinum Toxins); 0 (Fluoresceins); 0 (Haptens); 0 (botulinum toxin type B); 0 (botulinum toxin type E); 2321-07-5 (Fluorescein)

Record Date Created: 19970602

Record Date Completed: 19970602

3/9/24 (Item 24 from file: 155)

DIALOG(R) File 155:MEDLINE(R)

(c) format only 2005 Dialog. All rts. reserv.

11262225 PMID: 8577267

Immunological characterization of the neurotoxin produced by *Clostridium botulinum* type A associated with infant botulism in Japan.

Kozaki S; Nakaue S; Kamata Y

Department of Veterinary Science, College of Agriculture, University of Osaka Prefecture, Japan.

Microbiology and Immunology (JAPAN) 1995, 39 (10) p767-74, ISSN 0385-5600 Journal Code: 7703966

Publishing Model Print

Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
Subfile: INDEX MEDICUS

The neurotoxin associated with type A infant botulism in Japan shows different antigenic properties from those produced by authentic strains. The monoclonal antibodies recognizing the light chain reacted to both neurotoxins, whereas half the antibodies recognizing the heavy chain reacted specifically to the respective neurotoxin. Each neurotoxin showed its own manner of binding to brain synaptosomes. These results indicate that the distinguishable characteristics are ascribable to the heavy chain but not to the light chain. In both neurotoxins, an epitope recognized by the monoclonal antibody that reacts to the light chain and neutralizes the toxin was found to be very close to the amino-terminal half (H-1 fragment) of the heavy chain. This may support the hypothesis that the H-1 fragment functions in the transport of the light chain in the target cell.

Descriptors: *Botulinum Toxins--chemistry--CH; *Botulism--microbiology--MI; *Clostridium botulinum--chemistry--CH; *Neurotoxins--chemistry--CH; Amino Acid Sequence; Antibodies, Monoclonal --chemistry--CH; Antigens, Bacterial--immunology--IM; Botulinum Toxins--biosynthesis--BI; Clostridium botulinum --classification--CL; Clostridium botulinum --metabolism--ME; Endopeptidases; Epitopes--immunology--IM; Humans; Hydrolysis; Infant; Japan; Molecular Sequence Data; Neurotoxins--biosynthesis--BI; Protein Binding; Synaptosomes--chemistry--CH

CAS Registry No.: 0 (Antibodies, Monoclonal); 0 (Antigens, Bacterial); 0 (Botulinum Toxins); 0 (Epitopes); 0 (Neurotoxins)

Enzyme No.: EC 3.4.- (Endopeptidases)

Record Date Created: 19960314

Record Date Completed: 19960314

3/9/27 (Item 27 from file: 155)
DIALOG(R) File 155:MEDLINE(R)
(c) format only 2005 Dialog. All rts. reserv.

10978053 PMID: 7756853

Production of monoclonal antibodies specific to Clostridium botulinum type B neurotoxin.

Noah C W; Poteet S S; Ramos N C; Perez J C; Huang S Y

U.S. Food and Drug Administration, Dallas, TX 75204, USA.

Journal of AOAC International (UNITED STATES) Mar-Apr 1995, 78 (2)
p381-5, ISSN 1060-3271 Journal Code: 9215446

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Subfile: INDEX MEDICUS

Four monoclonal antibodies were produced for use in a rapid method to detect Clostridium botulinum type B neurotoxin. Cells of mouse myeloma cell line SP2/0 were fused with splenocytes of immunized BALB/c mice. An immunoblot assay of semipurified commercial neurotoxins of C. botulinum types A, B, C, D, E, and F was used to show specificity. All the monoclonal antibodies reacted with type B neurotoxin but did not cross-react with the other types. The monoclonal antibodies, separately and combined, did not neutralize the toxin in mice, and all showed specificity to the whole neurotoxin molecule and the heavy-chain component by immunoblot. No evidence of specific binding to the hemagglutinin molecule was noted. When tested against concentrated cultured supernatants

of C. botulinum types A, B, E, and F, the 4 monoclonal antibodies reacted only against type B strains. They will be incorporated into a rapid assay with other specific monoclonal antibodies to detect C. botulinum neurotoxins from pure cultures or suspect foods.

Tags: Male

Descriptors: *Antibodies, Monoclonal --biosynthesis--BI; * Botulinum Toxins--immunology--IM; *Immunoglobulin G--biosynthesis--BI; Animals; Antibodies, Monoclonal --immunology--IM; Antibody Specificity; Botulinum Toxins--analysis--AN; Enzyme-Linked Immunosorbent Assay; Hybridomas ; Immunoglobulin G--immunology--IM; Mice; Mice, Inbred BALB C

CAS Registry No.: 0 (Antibodies, Monoclonal); 0 (Botulinum Toxins); 0 (Immunoglobulin G)

Record Date Created: 19950626

Record Date Completed: 19950626

3/9/28 (Item 28 from file: 155)

DIALOG(R) File 155:MEDLINE(R)

(c) format only 2005 Dialog. All rts. reserv.

10932355 PMID: 7714333

Immunological detection of Clostridium botulinum toxin type A in therapeutic preparations.

Ekong T A; McLellan K; Sesardic D

Division of Bacteriology, National Institute for Biological Standards and Control, South Mimms, Hertfordshire.

Journal of immunological methods (NETHERLANDS) Mar 27 1995, 180 (2) p181-91, ISSN 0022-1759 Journal Code: 1305440

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Subfile: INDEX MEDICUS

The potent neurotoxins produced by strains of Clostridium botulinum act by blocking the release of acetylcholine from peripheral nerve junctions. This specific action of the botulinum neurotoxins is now being exploited therapeutically to treat a variety of conditions involving involuntary muscle spasms. We aimed to develop a sensitive and specific enzyme-linked immunosorbent assay (ELISA) which may be used in parallel with the currently accepted mouse bioassay test for the determination of botulinum neurotoxin type A in therapeutic preparations. High titre polyclonal antitoxins and their biotin derivatives, highly labelled horseradish peroxidase (HRP)-antibody conjugates, and streptavidin-biotin-HRP complexes were prepared and used in a sandwich ELISA for the detection of pure neurotoxin and neurotoxin in therapeutic material. The ELISA utilized either a monoclonal or polyclonal antibody as capture agent and HRP-labelled IgG or F(ab')₂ fragment as second antibody. The limit of detection was 4-8 pg of purified toxin/ml (gcv < 13%), equivalent to 1-2 mouse bioassay units/ml. The assay was used to evaluate therapeutic preparations and the results compared with the mouse bioassay. The lower limit of detection for a therapeutic preparation of BoTx_A was 2-5 mouse bioassay units/ml. Although across different manufacturers and bulk products there was no correlation between immunologically detected neurotoxin and its biological activity in different therapeutic preparations ($r = -0.44$, $p = 0.34$, $n = 8$), the assay could be used to quantify neurotoxin in therapeutic preparations derived from the same bulk concentrate and manufacturer. The assay is relatively simple, and may be readily adapted to routine monitoring of BoTx_A content in therapeutic preparations.

ORGANISMS: endospore-forming gram-positive rods and cocci
(Endospore-forming Gram-Positives); Clostridium botulinum
(Endospore-forming Gram-Positives); Balb/C mouse (Muridae)
COMMON TAXONOMIC TERMS: Bacteria; Eubacteria; Microorganisms; Animals;
Chordates; Mammals; Nonhuman Vertebrates; Nonhuman Mammals; Rodents;
Vertebrates
MISCELLANEOUS TERMS: BACTERIAL DISEASE; BOTULINUM TOXIN; BOTULISM;
ENZYME IMMUNOASSAY; IMMUNOLOGIC METHOD; INFECTION; MONOCLONAL ANTIBODY;
NEUROTOXIN; TOXICITY; TOXICOLOGY; TOXIGENIC COLONIES
CONCEPT CODES:
20501 Nervous system - General and methods
22501 Toxicology - General and methods
34502 Immunology - General and methods
36001 Medical and clinical microbiology - General and methods
BIOSYSTEMATIC CODES:
07810 Endospore-forming Gram-Positives
86375 Muridae

3/9/77 (Item 10 from file: 5)
DIALOG(R) File 5:Biosis Previews(R)
(c) 2005 BIOSIS. All rts. reserv.

0008131076 BIOSIS NO.: 199243099667
MONOCLONAL ANTIBODIES TO BOTULINUM TOXIN PRODUCED BY RECOMBINANT
TECHNOLOGY
AUTHOR: MIDDLEBROOK J L (Reprint); LEATHERMAN D L; SMITH T; CROWELL J
AUTHOR ADDRESS: DEP TOXINOL, PATHOPHYSIOL DIV, US ARMY MED RES INST INFECT
DIS, FREDERICK, MD 21702, USA**USA
JOURNAL: Toxicon 30 (5-6): p535 1992
CONFERENCE/MEETING: TENTH WORLD CONGRESS ON ANIMAL, PLANT AND MICROBIAL
TOXINS, SINGAPORE, SINGAPORE, NOVEMBER 3-8, 1991. TOXICON.
ISSN: 0041-0101
DOCUMENT TYPE: Meeting
RECORD TYPE: Citation
LANGUAGE: ENGLISH
DESCRIPTORS: ABSTRACT CLOSTRIDIUM -BOTULINUM ESCHERICHIA-COLI VACCINE
NEUROTOXIN
DESCRIPTORS:
MAJOR CONCEPTS: Immune System--Chemical Coordination and Homeostasis;
Infection; Nervous System--Neural Coordination; Pharmacology;
Physiology; Toxicology
BIOSYSTEMATIC NAMES: Enterobacteriaceae--Facultatively Anaerobic
Gram-Negative Rods, Eubacteria, Bacteria, Microorganisms;
Endospore-forming Gram-Positives--Eubacteria, Bacteria, Microorganisms
COMMON TAXONOMIC TERMS: Bacteria; Eubacteria; Microorganisms
CONCEPT CODES:
00520 General biology - Symposia, transactions and proceedings
10060 Biochemistry studies - General
10064 Biochemistry studies - Proteins, peptides and amino acids
10068 Biochemistry studies - Carbohydrates
20506 Nervous system - Pathology
22018 Pharmacology - Immunological processes and allergy
22501 Toxicology - General and methods
22505 Toxicology - Antidotes and prevention
31000 Physiology and biochemistry of bacteria
34502 Immunology - General and methods
34504 Immunology - Bacterial, viral and fungal
36002 Medical and clinical microbiology - Bacteriology
BIOSYSTEMATIC CODES:
06702 Enterobacteriaceae

against immobilized botulinum toxin subtype B allowed for the isolation of multiple high affinity Fab producing cell lines. These clones can be directed to express large quantities of Fab antibody at a significantly lower cost than hybridoma cell culture. Purification can be simplified by engineering an affinity tag directly into the nucleotide sequence of each antibody clone. Methods of construction and analysis are presented along with affinity constant determination and nucleotide sequencing data. Final rept. Feb 95-Jan 97. Prepared in cooperation with GEO-Centers, Inc., Rockville, MD.

Identifiers: Antibodies; Bacterial toxins; Clostridium botulinum
Record Date Created: 199712

3/9/104 (Item 5 from file: 156)

DIALOG(R)File 156:ToxFile

(c) format only 2005 Dialog. All rts. reserv.

826679 NLM Doc No: NTIS/AD-A223-009/2 Sec. Source ID: NTIS/AD-A223 009/2

Preparation and Characterization of Mouse and Human Monoclonal Antibodies to Botulinum Toxins.

Hunter KW; Fisher GW; Hemming VG

Uniformed Services Univ. of the Health Sciences, Bethesda, MD. Dept. of Pediatrics.

Source: Govt Reports Announcements & Index (GRA&I), Issue 20, 1990

Pub. Year: 1983

Order Information: NTIS/AD-A223 009/2, 17p

NTIS Prices: PC A03/MF A01

Languages: UNSPECIFIED

Record type: Completed

Subfile: NTIS

TD3: The goal during this year of the project was to begin preparing and characterizing mouse and human monoclonal antibodies to botulinum toxoids. The initial step was to refine enzyme immunoassays for identifying both mouse and human monoclonal antibodies in hybridoma culture supernatants. Progress in this area has been good, though minor technical problems remain to be solved. Optimization of these assays was accomplished with hyperimmune mouse and human antisera obtained from Dr. Martin Crumrine, USAMRIID. Keywords: Mice, Human monoclonal antibodies, Enzyme immunoassays, Type B toxoids, Type E toxoids, Toxic, Microbiology, Medical research, Botulinum toxins. (jg) Progress rept.

Identifiers: Bacterial toxins; Clostridium botulinum ; Monoclonal antibodies; Botulinum toxin

Record Date Created: 199011

3/9/105 (Item 6 from file: 156)

DIALOG(R)File 156:ToxFile

(c) format only 2005 Dialog. All rts. reserv.

785431 NLM Doc No: NTIS/03390028 Sec. Source ID: NTIS/ADA382808

Human Monoclonal Antibodies for Neutralization of Botulinum Neurotoxin.

Marks JD

California Univ., San Francisco.

Source: /u0103

Pub. Year: 2000

Order Information: 28p Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at

orders@z1s.fedworld.gov. NTIS is located at 5285 Port Royal Road,
Springfield, VA, 22161, USA.

NTIS Prices: PC A03/MF A01

Languages: UNSPECIFIED

Record type: Completed

Subfile: NTIS

Final rept. 1 May 1998-30 Apr 2000. The purpose of this work is to generate neutralizing human monoclonal antibodies to Botulinum neurotoxins (BoNT) A, B, and E. To generate a large panel of antibodies, mice transgenic for the human immunoglobulin were immunized with BoNT /A, B, and E binding domain (Hc). RNA was prepared, the human variable regions amplified by PCR and used to construct human single chain Fv (scFv) antibody fragment gene repertoires. The repertoires were cloned to create phage antibody libraries. Selection of the libraries on BoNT /A, B, and E Hc resulted in the isolation of a large panel of human monoclonal scFv antibody fragments. To demonstrate in vivo toxin neutralization, it was necessary to express the SCFv as fusions with the human IgG1 Fc region from the yeast Pichia pastoris due to the rapid serum clearance of scFv. SCFv-Fc fusions showed increased serum half life compared to scFv, but had a significantly shorter half life than IgG. Previously isolated murine and human scFv showed toxin neutralization in vivo as Fc fusions, with a combination of two neutralizing scFv-Fc fusions able to neutralize 100 toxin LD50s. Since the serum half life of the Fc fusions was significantly shorter than IgG's, the immunoglobulin VH and VL genes of neutralizing scFv were subcloned into a mammalian vector for expression as human IgG (in the case of human scFv) or mouse-human chimeric IgG (in the case of murine scFv). To date, three IgG have been constructed from the three neutralizing scFv and stable cell lines are being constructed. Concurrently, human IgG are being constructed from scFv derived from transgenic mice immunized with BoNT/A, B, and E Hc. Our plan is to purify IgG from each clone and evaluate in vivo neutralization potency for each unique antibody and for combinations of antibodies. In this way, we anticipate identifying panels of antibodies capable of neutralizing BoNT/A, B, and E.

Identifiers: Monoclonal antibodies; *Toxins and antitoxins; *Bacterial toxins; * Clostridium botulinum ; Mice; Laboratory animals; Stability; Humans; Isolation; Yeasts; Genes; Clones; Blood serum; In vivo analysis; Cells(Biology); Immunoglobulins; Reproduction(Physiology); Half life; Neurotoxins; Bacteriophages; Transcription(Genetics); Phage display; Recombinant antibodies

Record Date Created: 200105

3/9/179 (Item 4 from file: 440)

DIALOG(R) File 440:Current Contents Search(R)

(c) 2005 Inst for Sci Info. All rts. reserv.

10907476 References: 52

TITLE: Sequence homology and structural analysis of the clostridial neurotoxins

AUTHOR(S): Lacy DB; Stevens RC (REPRINT)

AUTHOR(S) E-MAIL: stevens@scripps.edu

CORPORATE SOURCE: Scripps Clin & Res Inst, Dept Mol Biol, 10550 N Torrey Pines Rd/La Jolla//CA/92037 (REPRINT); Scripps Clin & Res Inst, Dept Mol Biol, /La Jolla//CA/92037; Univ Calif Berkeley, Dept Chem, /Berkeley//CA/94720

PUBLICATION TYPE: JOURNAL

PUBLICATION: JOURNAL OF MOLECULAR BIOLOGY, 1999, V291, N5 (SEP 3), P 1091-1104

GENUINE ARTICLE#: 233UP

PUBLISHER: ACADEMIC PRESS LTD, 24-28 OVAL RD, LONDON NW1 7DX, ENGLAND

ISSN: 0022-2836

CURRENT CONTENTS JOURNAL ANNOUNCEMENT: CC LIFE, V42, N40

LANGUAGE: English DOCUMENT TYPE: ARTICLE

GEOGRAPHIC LOCATION: USA

SUBFILE: CC LIFE--Current Contents/Life Sciences

JOURNAL SUBJECT CATEGORY: MOLECULAR BIOLOGY & GENETICS;

ABSTRACT: The clostridial neurotoxins (CNTs), comprised of tetanus neurotoxin (TeNT) and the seven serotypes of botulinum neurotoxin (BoNT A-G), specifically bind to neuronal cells and disrupt neurotransmitter release by cleaving proteins involved in synaptic vesicle membrane fusion. In this study, multiple CNT sequences were analyzed within the context of the 1277 residue BoNT/A crystal structure to gain insight into the events of binding, pore formation, translocation, and catalysis that are required for toxicity. A comparison of the TeNT-binding domain structure to that of BoNT/A reveals striking differences in their surface properties. Further, the solvent accessibility of a key tryptophan in the C terminus of the BoNT/A-binding domain refines the location of the ganglioside-binding site. Data collected from a single frozen crystal of BoNT/A are included in this study, revealing slight differences in the binding domain orientation as well as density for a previously unobserved translocation domain loop. This loop and the conservation of charged residues with structural proximity to putative pore-forming sequences lend insight into the CNT mechanism of pore formation and translocation. The sequence analysis of the catalytic domain revealed an area near the active-site likely to account for specificity differences between the CNTs. It revealed also a tertiary structure, highly conserved in primary sequence, which seems critical to catalysis but is 30 Angstrom from the active-site zinc ion. This observation, along with an analysis of the 54 residue "belt" from the translocation domain are discussed with respect to the mechanism of catalysis. (C) 1999 Academic Press.

DESCRIPTORS--Author Keywords: clostridial neurotoxin ; botulinum neurotoxin ; tetanus neurotoxin ; translocation ; X-ray crystallography

IDENTIFIERS--KeyWord Plus: TOXIN TYPE-A; I-125-LABELED BOTULINUM NEUROTOXINS; NERVE-TERMINALS; TETANUS TOXIN; HEAVY-CHAIN; SEROTYPE-A; NEUROTRANSMITTER RELEASE; MONOCLONAL -ANTIBODIES; PATTERN-RECOGNITION; CRYSTAL-STRUCTURE

3/9/238 (Item 2 from file: 50)

DIALOG(R) File 50:CAB Abstracts

(c) 2005 CAB International. All rts. reserv.

0006270768 CAB Accession Number: 19901451034

Amplification systems in ELISA: use of NAD recycling system in the immunoassay of Clostridium botulinum toxins types A and B in food.

Modi, N. K.; Shone, C. C.; Hambleton, P.; Melling, J.

Porton International Ltd., 29 Chesham Place, London SW1X 8HB, UK.

Immunoassays for veterinary and food analysis - 1.

p.325-332

Publication Year: 1988

Editors: Morris, B.A.; Clifford, M.N.; Jackman, R.

Publisher: Elsevier Applied Science Publishers Ltd. Barking, Essex,

UK

ISBN: 1-85166-138-7

Language: English Record Type: Abstract

Document Type: Miscellaneous

Amplified enzyme-linked immunosorbent assays (ELISA) for botulinum neurotoxin types A and B using a commercially available NAD recycling system, the ability of these ELISA to detect toxins in food extracts, and the specificity of various monoclonal antibodies used in these assays

Record Date Completed: 19940418

3/9/49 (Item 49 from file: 155)

DIALOG(R) File 155:MEDLINE(R)

(c) format only 2005 Dialog. All rts. reserv.

08689355 PMID: 2668181 Record Identifier: 89339704

Immunological characterization of papain-induced fragments of Clostridium botulinum type A neurotoxin and interaction of the fragments with brain synaptosomes.

Kozaki S; Miki A; Kamata Y; Ogasawara J; Sakaguchi G

Department of Veterinary Science, College of Agriculture, University of Osaka Prefecture, Japan.

Infection and immunity (UNITED STATES) Sep 1989, 57 (9) p2634-9, ISSN 0019-9567 Journal Code: 0246127

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Other Citation Owner: NASA

Record type: MEDLINE; Completed

Subfile: INDEX MEDICUS

After treatment of Clostridium botulinum type A neurotoxin with papain, three fragments (Mrs, 101,000, 45,000, and 43,000) were purified by hydrophobic and ion-exchange chromatography with a high-performance liquid chromatographic system. Immunoblotting analyses with monoclonal antibodies showed that the 101,000-dalton fragment consisted of the light chain and a part of the heavy chain (H-1 fragment) linked together by a disulfide bond, and the other two fragments were correlated to the remaining portion of the heavy chain (H-2 fragment). The 45,000- and 43,000-dalton fragments effectively competed for binding of the 125I-labeled neurotoxin to synaptosomes, while no inhibition was observed with the 101,000-dalton fragment. The results indicate that the H-2 fragment interacts with the binding site on the neural membrane. The binding of the neurotoxin was impaired by treatment of synaptosomes with neuraminidase. Incorporation of gangliosides into neuraminidase-treated synaptosomes resulted in the restoration of binding. The results suggest that gangliosides are one of the components of the toxin-binding site.

Tags: Research Support, Non-U.S. Gov't

Descriptors: *Botulinum Toxins--immunology--IM; *Brain--metabolism--ME; *Clostridium botulinum--immunology--IM; *Neurotoxins--immunology--IM; *Papain--pharmacology--PD; *Synaptosomes--metabolism--ME; Animals; Antibodies, Monoclonal; Antigens, Bacterial--immunology--IM; Binding Sites, Antibody; Binding, Competitive; Botulinum Toxins--metabolism--ME; Botulinum Toxins--pharmacology--PD; Immunoblotting; Mice; Mice, Inbred BALB C; Molecular Weight; Neurotoxins--metabolism--ME; Neurotoxins--pharmacology--PD

CAS Registry No.: 0 (Antibodies, Monoclonal); 0 (Antigens, Bacterial); 0 (Binding Sites, Antibody); 0 (Botulinum Toxins); 0 (Neurotoxins)

Enzyme No.: EC 3.4.22.2 (Papain)

Record Date Created: 19890915

Record Date Completed: 19890915

?

21nov05 14:23:38 User228206 Session D2539.4

\$0.35 0.103 DialUnits File155

\$1.76 8 Type(s) in Format 9

\$1.76 8 Types

\$2.11 Estimated cost File155

[ExPASy Home page](#)[Site Map](#)[Search ExPASy](#)[Contact us](#)[Swiss-Prot](#)Search for 

UniProtKB/Swiss-Prot entry P04958

[Printer-friendly view](#)[Submit update](#)[Quick](#)

[\[Entry info\]](#) [\[Name and origin\]](#) [\[References\]](#) [\[Comments\]](#) [\[Cross-references\]](#)
[\[Keywords\]](#) [\[Features\]](#) [\[Sequence\]](#) [\[Tools\]](#)

Note: most headings are clickable, even if they don't appear as links. They link to the user manual or other documents.

Entry information

Entry name **TETX_CLOTE**
 Primary accession number **P04958**
 Secondary accession numbers None
 Entered in Swiss-Prot in Release 05, August 1987
 Sequence was last modified in Release 05, August 1987
 Annotations were last modified in Release 49, January 2006

Name and origin of the protein

Protein name **Tetanus toxin [Precursor]**
 Synonyms **EC 3.4.24.68**
Tentoxylisin
Tetanus toxin light chain
 (Tetanus toxin chain L)
Tetanus toxin heavy chain
 (Tetanus toxin chain H)

Contains

Gene name **Name: tetX**
 OrderedLocusNames: ctp60
 From **Clostridium tetani [TaxID: 1513]**
 Encoded on **Plasmid pE88; Plasmid 75 Kbp.**
 Taxonomy **Bacteria; Firmicutes; Clostridia; Clostridiales; Clostridiace**
Clostridium.

References

[1] NUCLEOTIDE SEQUENCE [GENOMIC DNA].

PLASMID=75 Kbp;

PubMed=3536478 [NCBI, ExPASy, EBI, Israel, Japan]

Eisel U., Jarausch W., Goretzki K., Henschen A., Engels J., Weller U., Hudel M., Habermas E., Niemann H.;

"Tetanus toxin: primary structure, expression in E. coli, and homology with botulinum toxin" EMBO J. 5:2495-2502(1986).

[2] NUCLEOTIDE SEQUENCE [GENOMIC DNA].

PLASMID=75 Kbp;**STRAIN=CN3911;**

PubMed=3774547 [NCBI, ExPASy, EBI, Israel, Japan]

- Fairweather N.F., Lyness V.A.;
"The complete nucleotide sequence of tetanus toxin.";
Nucleic Acids Res. 14:7809-7812(1986).
- [3] NUCLEOTIDE SEQUENCE [LARGE SCALE GENOMIC DNA].
PLASMID=pE88;
STRAIN=Massachusetts / E88;
DOI=10.1073/pnas.0335853100; PubMed=12552129 [NCBI, ExPASy, EBI, Israel, Japan]
Brueggemann H., Baeumer S., Fricke W.F., Wiezer A., Liesegang H., Decker I., Herzberg
Martinez-Arias R., Merkl R., Henne A., Gottschalk G.;
"The genome sequence of *Clostridium tetani*, the causative agent of tetanus disease.";
Proc. Natl. Acad. Sci. U.S.A. 100:1316-1321(2003).
- [4] NUCLEOTIDE SEQUENCE [GENOMIC DNA] OF 742-1314.
PLASMID=75 Kbp;
PubMed=3510187 [NCBI, ExPASy, EBI, Israel, Japan]
Fairweather N.F., Lyness V.A., Pickard D.J., Allen G., Thomson R.O.;
"Cloning, nucleotide sequencing, and expression of tetanus toxin fragment C in *Escherich coli*.";
J. Bacteriol. 165:21-27(1986).
- [5] PARTIAL PROTEIN SEQUENCE, AND DISULFIDE BONDS.
PubMed=2108021 [NCBI, ExPASy, EBI, Israel, Japan]
Krieglstein K., Henschen A., Weller U., Habermann E.;
"Arrangement of disulfide bridges and positions of sulfhydryl groups in tetanus toxin.";
Eur. J. Biochem. 188:39-45(1990).
- [6] PARTIAL PROTEIN SEQUENCE.
PubMed=1935979 [NCBI, ExPASy, EBI, Israel, Japan]
Krieglstein K.G., Henschen A.H., Weller U., Habermann E.;
"Limited proteolysis of tetanus toxin. Relation to activity and identification of cleavage sites;
Eur. J. Biochem. 202:41-51(1991).
- [7] IDENTIFICATION AS ZINC-PROTEASE.
PubMed=1396558 [NCBI, ExPASy, EBI, Israel, Japan]
Schiavo G., Poulain B., Rossetto O., Benfenati F., Tauc L., Montecucco C.;
"Tetanus toxin is a zinc protein and its inhibition of neurotransmitter release and protease
activity depend on zinc.";
EMBO J. 11:3577-3583(1992).
- [8] IDENTIFICATION OF SUBSTRATE.
DOI=10.1038/359832a0; PubMed=1331807 [NCBI, ExPASy, EBI, Israel, Japan]
Schiavo G., Benfenati F., Poulain B., Rossetto O., de Laureto P.P., Dasgupta B.R.,
Montecucco C.;
"Tetanus and botulinum-B neurotoxins block neurotransmitter release by proteolytic cleav;
of synaptobrevin.";
Nature 359:832-835(1992).
- [9] X-RAY CRYSTALLOGRAPHY (2.7 ANGSTROMS) OF 874-1314.
PubMed=9334741 [NCBI, ExPASy, EBI, Israel, Japan]
Umland T.C., Wingert L.M., Swaminathan S., Furey W.F. Jr., Schmidt J.J., Sax M.;
"Structure of the receptor binding fragment HC of tetanus neurotoxin.";
Nat. Struct. Biol. 4:788-792(1997).

Comments

- **FUNCTION:** Tetanus toxin acts by inhibiting neurotransmitter release. It binds to peripheral neuronal synapses, is internalized and moves by retrograde transport up the axon into the spinal cord where it can move between postsynaptic and presynaptic neurons. It inhibits neurotransmitter release by acting as a zinc endopeptidase that catalyzes the hydrolysis of the 76-Gln-Phe-77 bond of synaptobrevin-2.
- **CATALYTIC ACTIVITY:** Hydrolysis of 76-Gln-Phe-77 bond in synaptobrevin 2.
- **COFACTOR:** Binds 1 zinc ion per subunit (*By similarity*).
- **SUBUNIT:** The precursor polypeptide is subsequently cleaved to yield subchains L and M. These remain linked by a disulfide bridge and are non-toxic after separation.
- **MISCELLANEOUS:** The C-terminus of the heavy chain binds to ganglioside receptors.
- **SIMILARITY:** Belongs to the peptidase M27 family [view classification].

Copyright

This Swiss-Prot entry is copyright. It is produced through a collaboration between the Swiss Institute of Bioinformatics and the EMBL outstation - the European Bioinformatics Institute. There are no restrictions on its use as long as content is in no way modified and this statement is not removed.

Cross-references

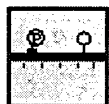
EMBL	X04436; CAA28033.1; -;	[EMBL / GenBank / DDBJ]
	Genomic_DNA.	[CoDingSequence]
	X06214; CAA29564.1; -;	[EMBL / GenBank / DDBJ]
	Genomic_DNA.	[CoDingSequence]
	AF528097; AAO37454.1; -;	[EMBL / GenBank / DDBJ]
PIR	Genomic_DNA.	[CoDingSequence]
	M12739; AAA23282.1; -;	[EMBL / GenBank / DDBJ]
	Genomic_DNA.	[CoDingSequence]
	A25689; BTCLTN.	
	1A8D; X-ray; @=864-1314.	[ExPASy / RCSB / EBI]
PDB	1AF9; X-ray; @=864-1314.	[ExPASy / RCSB / EBI]
	1D0H; X-ray; A=871-1314.	[ExPASy / RCSB / EBI]
	1DFQ; X-ray; A=871-1314.	[ExPASy / RCSB / EBI]
	1DIW; X-ray; A=874-1314.	[ExPASy / RCSB / EBI]
	1DLL; X-ray; A=874-1314.	[ExPASy / RCSB / EBI]
	1FV2; X-ray; A=-.	[ExPASy / RCSB / EBI]
	1FV3; X-ray; A/B=864-1314.	[ExPASy / RCSB / EBI]
	1YVG; X-ray; A=1-457.	[ExPASy / RCSB / EBI]
	1YXW; X-ray; A=874-1314.	[ExPASy / RCSB / EBI]
	1YYN; X-ray; A=874-1314.	[ExPASy / RCSB / EBI]
MEROPS	1Z7H; X-ray; A=1-442.	[ExPASy / RCSB / EBI]
	Detailed list of linked structures.	
	M27.001; -.	
LinkHub	P04958; -.	
CMR	P04958; ctp60.	
InterPro	IPR011591; Botulinum.	
	IPR006025; Pept_M_Zn_BS.	
	IPR000395; Peptidase_M27.	
	IPR012928; Toxin_recpt_bd_N.	
	IPR012500; Toxin_trans.	
	Graphical view of domain structure.	

Pfam PF01742; Peptidase_M27; 1.
 PF07953; Toxin_R_bind_N; 1.
 PF07952; Toxin_trans; 1.
 Pfam graphical view of domain structure.
PRINTS PR00760; BONTOXILYSIN.
ProDom PD001963; Botulinum; 1.
 [Domain structure / List of seq. sharing at least 1 domain]
PROSITE PS00142; ZINC_PROTEASE; 1.
HOGENOM [Family / Alignment / Tree]
BLOCKS P04958.
ProtoNet P04958.
ProtoMap P04958.
PRESAGE P04958.
DIP P04958.
ModBase P04958.
SWISS-2DPAGE Get region on 2D PAGE.
UniRef View cluster of proteins with at least 50% / 90% / 100% identity.

Keywords

3D-structure; Complete proteome; Direct protein sequencing; Hydrolase; Metal-binding; Metalloprotease; Neurotoxin; Plasmid; Protease; Toxin; Zinc.

Features



Feature table viewer



Feature aligner

Key	From	To	Length	Description	FTId
INIT_MET	0	0			
CHAIN	1	456	456	Tetanus toxin light chain.	PRO_00000
CHAIN	457	1314	858	Tetanus toxin heavy chain.	PRO_00000
ACT_SITE	233	233		<i>By similarity.</i>	
METAL	232	232		Zinc (catalytic) <i>(By similarity).</i>	
METAL	236	236		Zinc (catalytic) <i>(By similarity).</i>	
DISULFID	438	466		Interchain (between light and heavy chains).	
DISULFID	1076	1092			
STRAND	867	867	1		
STRAND	871	871	1		
STRAND	874	874	1		
HELIX	876	882	7		
TURN	883	883	1		
STRAND	884	891	8		
TURN	892	893	2		
STRAND	894	897	4		
STRAND	899	901	3		
STRAND	904	907	4		

TURN	909	910	2
STRAND	912	915	4
STRAND	917	927	11
TURN	928	929	2
STRAND	932	935	4
HELIX	938	940	3
TURN	941	946	6
STRAND	947	947	1
STRAND	949	956	8
HELIX	962	968	7
TURN	969	970	2
STRAND	972	977	6
STRAND	980	981	2
HELIX	983	985	3
STRAND	987	995	9
TURN	996	997	2
STRAND	998	1004	7
TURN	1006	1007	2
STRAND	1008	1008	1
STRAND	1010	1016	7
STRAND	1019	1020	2
TURN	1021	1022	2
STRAND	1023	1023	1
STRAND	1025	1029	5
STRAND	1031	1037	7
TURN	1039	1040	2
STRAND	1041	1047	7
TURN	1048	1049	2
STRAND	1050	1056	7
TURN	1058	1059	2
STRAND	1067	1075	9
TURN	1079	1080	2
STRAND	1082	1093	12
HELIX	1097	1105	9
TURN	1106	1107	2
STRAND	1110	1112	3
STRAND	1114	1114	1
TURN	1116	1117	2
STRAND	1118	1120	3
STRAND	1122	1122	1
TURN	1123	1124	2
STRAND	1127	1131	5
HELIX	1132	1134	3
TURN	1135	1136	2
STRAND	1137	1143	7
TURN	1144	1145	2

STRAND	1146	1146	1
STRAND	1148	1152	5
STRAND	1155	1158	4
TURN	1159	1162	4
STRAND	1163	1166	4
STRAND	1169	1169	1
STRAND	1171	1171	1
STRAND	1173	1180	8
TURN	1184	1185	2
STRAND	1188	1188	1
STRAND	1190	1190	1
TURN	1191	1192	2
STRAND	1193	1201	9
TURN	1202	1203	2
STRAND	1204	1211	8
TURN	1212	1213	2
STRAND	1216	1217	2
TURN	1218	1220	3
STRAND	1221	1223	3
STRAND	1225	1227	3
TURN	1231	1232	2
STRAND	1235	1236	2
STRAND	1238	1242	5
STRAND	1245	1245	1
TURN	1247	1248	2
STRAND	1249	1249	1
STRAND	1252	1257	6
STRAND	1259	1261	3
STRAND	1263	1272	10
STRAND	1274	1274	1
TURN	1275	1276	2
STRAND	1277	1277	1
STRAND	1280	1286	7
HELIX	1287	1292	6
TURN	1293	1294	2
STRAND	1295	1297	3
TURN	1299	1300	2
STRAND	1302	1305	4
STRAND	1308	1308	1
TURN	1309	1310	2
STRAND	1311	1311	1

Sequence information

Length: **1314 AA** [This is the length of the unprocessed precursor] Molecular weight: **150551 Da** [This is the MW of the unprocessed precursor]

CRC64: **134C3657133EF81D**
is a checksum on the sequence

10 20 30 40 50 60
PITINNFYRS DPVNNDTIIM MEPPYCKGLD IYYKAFKITD RIWIVPERYE FGTKPEDFNP

70 80 90 100 110 120
PSSLIEGASE YYDPNYLRTD SDKDRFLQTM VKLFNRIKNN VAGEALLDKI INAIPLYGNS

130 140 150 160 170 180
YSLLDKFDTN SNSVSFNLE QDPGSGATTKS AMLTNLIIFG PGPVLNKNEV RGIVLRVDNK

190 200 210 220 230 240
NYFPCRDGFG SIMQMAFCPE YVPTFDNVIE NITSLTIGKS KYFQDPALLL MHELIHVLHG

250 260 270 280 290 300
LYGMQVSSHE IIPSKQEIYM QHTYPISAE LFTFGGQDAN LISIDIKNDL YEKTLNDYKA

310 320 330 340 350 360
IANKLSQVTS CNDPNIDIDS YKQIYQQKYQ FDKDSNGQYI VNEDKFQILY NSIMYGFTEI

370 380 390 400 410 420
ELGKKFNIKT RLSYFSMNHD PVKIPNLLDD TIYNDTEGFN IESKDLKSEY KGQNMVRVNTN

430 440 450 460 470 480
AFRNVDGSG L VSKLIGLCKK IIPPTNIREN LYNRTASLTD LGGELCIKIK NEDLTFIAEK

490 500 510 520 530 540
NSFSEEPFQD EIVSYNTKNK PLNFNYS LDK IIVDYNLQSK ITLPNDRTTP VTKGIPYAPE

550 560 570 580 590 600
YKSNAASTIE IHNIDDNTIY QYLYAQKSPT TLQRITMTNS VDDALINSTK IYSYFPSVIS

610 620 630 640 650 660
KVNQGAQGIL FLQWVRDIID DFTNESSQKT TIDKISDVST IVPYIGPALN IVKQGYEGNF

670 680 690 700 710 720
IGALETGTVV LLEYIPEIT LPVIAALSIA ESSTQKEKII KTIDNFLEKR YEKWIEVYKL

730 740 750 760 770 780
VKAKWLGTVN TQFQKRSYQM YRSLEYQVDA IKKIIDYEYK IYSGPDKEQI ADEINNLKNK

790 800 810 820 830 840
LEEKANKAMI NINIFMRESS RSFLVNQMIN EAKKQLLEFD TQSKNILMQY IKANSKFIGI

850 860 870 880 890 900
TELKKLESKI NKVFSTPIPF SYSKNLDCWV DNEEDIDVIL KKSTILNLDI NNDIISDISG

910 920 930 940 950 960
FNSSVITYPD AQLVPGINGK AIHLVNNES EVIVHKAMDI EYNDMFNNFT VSFWLRVPKV

970 980 990 1000 1010 1020
SASHLEQYGT NEYSIISSMK KHSLSIGSGW SVSLKGNLI WTLKDSAGEV RQITFRDLPD
1030 1040 1050 1060 1070 1080
KFNAYLANKW VFITITNDRL SSANLYINGV LMGSAEITGL GAIREDDNNIT LKLDRCNNNN
1090 1100 1110 1120 1130 1140
QYVSIKDFRI FCKALNPKEI EKLYTSYLSI TFLRDFWGNP LRYDTEYYLI PVASSSKDVQ
1150 1160 1170 1180 1190 1200
LKNITDMYL TNAPSYTNGK LNIYYRRLYN GLKFIKRYT PNNEIDSFVK SGDFIKLYVS
1210 1220 1230 1240 1250 1260
YNNNEHIVGY PKDGNFNNL DRILRVGYNA PGIPLYKKME AVKLRDLKTY SVQLKLYDDK
1270 1280 1290 1300 1310
NASLGLVGTH NGQIGNDPNR DILIASNWYF NHLKDKILGC DWYFVPTDEG WTND

P(in F/ for

View entry in original UniProtKB/Swiss-Prot format

View entry in raw text format (no links)

Report form for errors/updates in this UniProtKB/Swiss-Prot entry

BLAST

BLAST submission on
ExPASy/SIB
or at NCBI (USA)



Sequence analysis tools: ProtParam,
ProtScale, Compute pI/Mw, PeptideMass,
PeptideCutter, Dotlet (Java)



ScanProsite, MotifScan



Submit a homology modeling request to
SWISS-MODEL

NPS@

NPSA Sequence
analysis tools



ExPASy Home page

Site Map

Search ExPASy

Contact us

Swiss-Prot

Hosted by  CBR Canada Mirror sites: Australia Brazil Korea Switzerland Taiwan USA

CLUSTAL W (1.82) multiple sequence alignment

```

sp|P04958|TETX_CLOTE      -PITINNFYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERY
sp|P10845|BXA1_CLOBO      -PFVNKQFNYPKDPVNGVDIAYIKIPNVG-QMQPVKAFKIHNKIWVIPERD
sp|Q45894|BXA2_CLOBO      -PFVNKQFNYPKDPVNGVDIAYIKIPNAG-QMQPVKAFKIHNKIWVIPERD
tr|Q58GH1|Q58GH1_CLOBO    MPFVNKQFNYPKDPVNGVDIAYIKIPNAG-QMQPVKAFKIHNKIWVIPERD
tr|Q3LRX8|Q3LRX8_CLOBO    MPLVNQQINYYDPVNGVDIAYIKIPNAG-KMQPVKAFKIHNKVWVIPERD
                          *: . : : . * * * * . * : : * * * * : : : : * *

sp|P04958|TETX_CLOTE      EFGTKPE-DFNPPSSLIEGASEYYDPNYLRSTDSDKDRFLQTMVKLFNRIK
sp|P10845|BXA1_CLOBO      TFTNPEEGDLNPPPEAKQVPVSYDSTYLSTDNEKDNLYKGVTKLFERIY
sp|Q45894|BXA2_CLOBO      TFTNPEEGDLNPPPEAKQVPVSYDSTYLSTDNEKDNLYKGVTKLFERIY
tr|Q58GH1|Q58GH1_CLOBO    TFTNPEEGDLNPPPEAKQVPVSYDSTYLSTDNEKDNLYKGVTKLFERIY
tr|Q3LRX8|Q3LRX8_CLOBO    IFTNPEEVDLNPPPEAKQVPISYYDSAYLSTDNEKDNLYKGVTKLFERIY
                          * . * * : * * . : . * * . * * * : * : : * * : *

sp|P04958|TETX_CLOTE      NNVAGEALLDKIINAIPYLGNSYSLDKFDTNSNSVSFNLLEQDPSGATT
sp|P10845|BXA1_CLOBO      STDLGRMLLTSIVRGIPFWGGSTIDTELKVIDTNCINVIQPDG-----S
sp|Q45894|BXA2_CLOBO      STDLGRMLLTSIVRGIPFWGGSTIDTELKVIDTNCINVIQPDG-----S
tr|Q58GH1|Q58GH1_CLOBO    STDLGRMLLTSIVRGIPFWGGSTIDTELKVIDTNCINVIQPDG-----S
tr|Q3LRX8|Q3LRX8_CLOBO    STDLGRMLLISIVRGIPFWGGGKIDTELKVIDTNCINIIQLDD-----S
                          .. * . * * . * : : . * : * . : : : * : : : :

sp|P04958|TETX_CLOTE      KSAMLTNLIIFGPGPVLNKNNEVRGIVLRVDNKNYFPCRDGFGSIMQMAFC
sp|P10845|BXA1_CLOBO      YRSEELNLVIIGPSADIIQFECKSFGHEVLN----LTRNGYGSTQYIRFS
sp|Q45894|BXA2_CLOBO      YRSEELNLVIIGPSADIIQFECKSFGHDVLN----LTRNGYGSTQYIRFS
tr|Q58GH1|Q58GH1_CLOBO    YRSEELNLVIIGPSADIIQFECKSFGHDVLN----LTRNGYGSTQYIRFS
tr|Q3LRX8|Q3LRX8_CLOBO    YRSEELNLAIIGPSANIIESQCSSFRRDDVLN----LTRNGYGSTQYIRFS
                          : * * * : * * . : : : : : * * * : * : * : *

sp|P04958|TETX_CLOTE      PEYVPTFDNVNIENITSLTIGKSKYFQDPALLMHLEIHVLHGLYGMQVSS
sp|P10845|BXA1_CLOBO      PDFTFGFEESELEVDTNPLLGAAGKFATDPAVTLAHELIHAGHRLYGIAINP
sp|Q45894|BXA2_CLOBO      PDFTFGFEESELEVDTNPLLGAAGKFATDPAVTLAHELIHAEHRLYGIAINP
tr|Q58GH1|Q58GH1_CLOBO    PDFTFGFEESELEVDTNPLLGAAGKFATDPAVTLAHELIHAEHRLYGIAINP
tr|Q3LRX8|Q3LRX8_CLOBO    PDFTVGFEESELEVDTNPLLGAAGKFAQDPAVALAHELIHAEHRLYGIANT
                          * : : . * : : : * * . : * . : * * : * * * : * * : : .

sp|P04958|TETX_CLOTE      HEIIPSKQEIIYMQHT-YPISEELFTFGGQDANLISIDIKNDLYEKTLDND
sp|P10845|BXA1_CLOBO      NRVFVKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEFRLYYYNK
sp|Q45894|BXA2_CLOBO      NRVFVKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEFRLYYYNK
tr|Q58GH1|Q58GH1_CLOBO    NRVFVKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEFRLYYYNK
tr|Q3LRX8|Q3LRX8_CLOBO    NRVFVKVNTNAYYEMAGLEVSLEELITFGGNDAKFIDSLQKKEFSLYYYNK
                          : : : : : : * : : : * * * * * : * : : : * . : : : *

sp|P04958|TETX_CLOTE      YKAIANKLSQVTSNPDNIDIDSYKQIYQQKYQFDKDSNGQYIVNEDKQFQ
sp|P10845|BXA1_CLOBO      FKDIAS TLNKA KSI VGT TASLQYMKNVFKEKYLLSEDTSGKFSVDKLFKD
sp|Q45894|BXA2_CLOBO      FKDVASTLNKA KSI IGT TASLQYMKNVFKEKYLLSEDTSGKFSVDKLFKD
tr|Q58GH1|Q58GH1_CLOBO    FKDVASTLNKA KSI IGT TASLQYMKNVFKEKYLLSEDTSGKFSVDKLFKD
tr|Q3LRX8|Q3LRX8_CLOBO    FKDIAS TLNKA KSI VGT TASLQYMKNVFKEKYLLSEDTSGKFLVDRKLFKD
                          : * : * . . . . . * . . . : * : : : * * : : * : * : * : *

sp|P04958|TETX_CLOTE      ILYNSIMYGFTIELGKKFNKTRLSYFSMNHDPVKIPNLLDDTIYNDTE
sp|P10845|BXA1_CLOBO      KLYKMLTEIYTEDNFVKKFVLRKTYLNFDKAVFKIN-IVPKVNYTIYD
sp|Q45894|BXA2_CLOBO      KLYKMLTEIYTEDNFVNFVKVINRKYTYLNFDKAVFRIN-IVPDENYTIKD
tr|Q58GH1|Q58GH1_CLOBO    KLYKMLTEIYTEDNFVNFVKVINRKYTYLNFDKAVFRIN-IVPDENYTIKD
tr|Q3LRX8|Q3LRX8_CLOBO    ELYKLLTEIYTEDNFVKKFVLRKTYLNFDKAVFKIN-IVPDVNYTIHD
                          * * : : * * : : : * : * : : : : * : : . * . :

sp|P04958|TETX_CLOTE      GFNIESKDLKSEYKGQNMVRVNTNAFRNVD-GSGLVSKLIGLCKKIIPPTN

```

sp	P10845	BXA1_CLOBO	GFNLRNTNLAANFNGQNTIEINNMNFTKLKNFTGLFEFYKLLCVRGIITSK
sp	Q45894	BXA2_CLOBO	GFNLRNTNLAANFNGQNTIEINNMNFTKLKNFTGLFEFYKLLCVRGIITSK
tr	Q58GH1	Q58GH1_CLOBO	GFNLRNTNLAANFNGQNTIEINNMNFTKLKNFTGLFEFYKLLCVRGIITSK
tr	Q3LRX8	Q3LRX8_CLOBO	GFNLRNTNLAANFNGQNTIEINNMNFTKLKNFTGLFEFYKLLCVRGIITSK
***:.. : * : : : *** : : * . * : . : * : . : * : . :			
sp	P04958	TETX_CLOTE	IRENLNRTASLTDLGGELCIKIKNEDLTFIAEKNSFSEEPFQDEIVSYN
sp	P10845	BXA1_CLOBO	TKSLDKGYNKALN----DLCIKVNNWDLFFSPSEDNFTNDLNKGEEITSD
sp	Q45894	BXA2_CLOBO	TKSLDEGYNKALN----DLCIKVNNWDLFFSPSEDNFTNDLNKGEEITAD
tr	Q58GH1	Q58GH1_CLOBO	TKSLDEGYNKALN----DLCIKVNNWDLFFSPSEDNFTNDLNKGEEITAD
tr	Q3LRX8	Q3LRX8_CLOBO	TKSLDEGYNKALN----ELCIKVNNWDLFFSPSEDNFTNDLNKGEEITSD
: . . . : * . : * : : : * : : : * : : : * : : : * : : :			
sp	P04958	TETX_CLOTE	TKNKPLNFNYSLDKIIVDYNLQSKITLTPNDRTP--VTKGIPYAPEYKS
sp	P10845	BXA1_CLOBO	TNIEAAEENISLDLIQYYLTFNFDNEPENISIEENLSSDIIGQLELMPNI
sp	Q45894	BXA2_CLOBO	TNIEAAEENISLDLIQYYLTFNFDNEPENISIEENLSSDIIGQLELMPNI
tr	Q58GH1	Q58GH1_CLOBO	TNIEAAEENISLDLIQYYLTFNFDNEPENISIEENLSSDIIGQLELMPNI
tr	Q3LRX8	Q3LRX8_CLOBO	TNIEAAEENISLDLIQYYLTFNFDNEPENISIEENLSSDIIGQLELMPNI
* : . . : * * * * * . . * : : : :			
sp	P04958	TETX_CLOTE	NAASTIEIHNIDDNTIYQYLYAQKSPTTLQRITMTNSVDDALINSTKIYS
sp	P10845	BXA1_CLOBO	ERFPNGKKYELDKYTMFHYLRAQEFEGHKSRIALTNSVNEALLNPSRVYT
sp	Q45894	BXA2_CLOBO	ERFPNGKKYELDKYTMFHYLRAQEFEGHGSRIILTNSAEEALLKPNVAYT
tr	Q58GH1	Q58GH1_CLOBO	ERFPNGKKYELDKYTMFHYLRAQEFEGHGSRIILTNSAEEALLKPNVAYT
tr	Q3LRX8	Q3LRX8_CLOBO	ERFPNGKKYELDKYTMFHYLRAQEFKHNSRIILTNSAKEALLKPNIVYT
: . . : : : : * : : * * : . * : * : * : : * : :			
sp	P04958	TETX_CLOTE	YFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESQKTTIDKISDVSTIV
sp	P10845	BXA1_CLOBO	FFSSDYVKKVKNKATEAMFLGWVEQLVYDFTDETSEVSTTDKIADITIII
sp	Q45894	BXA2_CLOBO	FFSSKYVKKINKAVEAFMFLNWAEELVYDFTDETNEVTTMDKIADITIIIV
tr	Q58GH1	Q58GH1_CLOBO	FFSSKYVKKINKAVEAFMFLNWAEELVYDFTDETNEVTTMDKIADITIIIV
tr	Q3LRX8	Q3LRX8_CLOBO	FFSSKYIKAINKAVEAVTFVNWIEENLVYDFTDETNEVSTMDKIADITIVI
: * . * . . : * : : . . * : * : : * : * : : * : * : : :			
sp	P04958	TETX_CLOTE	PYIGPALNIVKQGYEGNFIGALETTGVVLLLEYIPEITLPVIAALSIAES
sp	P10845	BXA1_CLOBO	PYIGPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSY
sp	Q45894	BXA2_CLOBO	PYIGPALNIGNMLSKGEFVEAIIFTGVVAMLEFIPEYALPVFGTFAIVSY
tr	Q58GH1	Q58GH1_CLOBO	PYIGPALNIGNMLSKGEFVEAIIFTGVVAMLEFIPEYALPVFGTFAIVSY
tr	Q3LRX8	Q3LRX8_CLOBO	PYIGPALNIGNMIYKGEFVEAIIFTGVVAMLEFIPEYALPVFGTFAIVSY
***** : : : * : * : * . * : * : * : * : * : * : :			
sp	P04958	TETX_CLOTE	STQKEKIIKTIDNFLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYR
sp	P10845	BXA1_CLOBO	IANKVLTQVTIDNALS KRNEKWDEVYKYIVTNWLAKVNTQIDLIREKMKKE
sp	Q45894	BXA2_CLOBO	IANKVLTQVTINNALS KRNEKWDEVYKYIVTNWLAKVNTQIDLIREKMKK
tr	Q58GH1	Q58GH1_CLOBO	IANKVLTQVTINNALS KRNEKWDEVYKYIVTNWLAKVNTQIDLIREKMKK
tr	Q3LRX8	Q3LRX8_CLOBO	VSNKVLTVQVTIDNALS KRNEKWDEVYKYIVTNWLAI VNTQINLIREKMKK
: : * : : * : * * * * * : : * . * : : : : * . :			
sp	P04958	TETX_CLOTE	SLEYQVDAIKKIIDYEQYKISGPDKEQIADIEINNLNKLEEKANKAMINI
sp	P10845	BXA1_CLOBO	ALENQAEATKAIINYQYNQYTEEEKNINFNIDDLSSKLNESINKAMINI
sp	Q45894	BXA2_CLOBO	ALENQAEATKAIINYQYNQYTEEEKNINFNIDDLSSKLNESINSAMINI
tr	Q58GH1	Q58GH1_CLOBO	ALENQAEATKAIINYQYNQYTEEEKNINFNIDDLSSKLNESINSAMINI
tr	Q3LRX8	Q3LRX8_CLOBO	ALENQAEATKAIINYQYNQYTEEEKNINFNIDDLSSKLNESINSAMINI
: * * . : * * * : * : * : : * : * : : * : * : : * : * : :			
sp	P04958	TETX_CLOTE	NIFMRESSRSFLVNQMINAEAKKQLLEFDTQSKNILMQYIKANSKFIGITE
sp	P10845	BXA1_CLOBO	NKFLNQCSVSYLMSMIPYGVKRLKDFDASLKDALLKYIYDN-RGTLIGQ
sp	Q45894	BXA2_CLOBO	NKFLDQCSVSYLMSMIPYAVKRLKDFDASVRDVLLKYIYDN-RGTLVLQ
tr	Q58GH1	Q58GH1_CLOBO	NKFLDQCSVSYLMSMIPYAVKRLKDFDASVRDVLLKYIYDN-RGTLVLQ
tr	Q3LRX8	Q3LRX8_CLOBO	NKFLDQCSVSYLMSMIPYAVKRLKDFDASVRDVLLKYIYDN-RGTLIGQ

12/9/05

sp Q45894 BXA2_CLOBO	VMKSKDDQGIRNKCKMNLQDNNGNDIGFIGFH-----LYDNIAKLVASNW
tr Q58GH1 Q58GH1_CLOBO	VMKSKDDQGIRNKCKMNLQDNNGNDIGFIGFH-----LYDNIAKLVASNW
tr Q3LRX8 Q3LRX8_CLOBO	VMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH-----QFNNAIKLVASNW
	: * : . :*: * :. :*: * * * * *
sp P04958 TETX_CLOTE	YFNHLK--DKILGCDWYFVPTDEGWTND--
sp P10845 BXA1_CLOBO	YNRQIERSSRTLGCSEFIPVDDGWGERPL
sp Q45894 BXA2_CLOBO	YNRQVGKASRTFGCSEFIPVDDGWGESL
tr Q58GH1 Q58GH1_CLOBO	YNRQVGKASRTFGCSEFIPVDDGWGESL
tr Q3LRX8 Q3LRX8_CLOBO	YNRQIERSSRTLGCSEFIPVDDGWRERPL
	* .:: .: :*,* *,*,*,** :

FileUp

MSF: 1330 Type: P Check: 1777 ..

Name: sp|P04958|TETX_CLOTE oo Len: 1330 Check: 4312 Weight: 0.100
 Name: sp|P10845|BXA1_CLOBO oo Len: 1330 Check: 3941 Weight: 0.100
 Name: sp|Q45894|BXA2_CLOBO oo Len: 1330 Check: 1067 Weight: 0.100
 Name: tr|Q58GH1|Q58GH1_CLOBO oo Len: 1330 Check: 1098 Weight: 0.100
 Name: tr|Q3LRX8|Q3LRX8_CLOBO oo Len: 1330 Check: 1359 Weight: 0.100

//

sp P04958 TETX_CLOTE	.PITINNFRY	SDPVNNDTII	MMEPPYCKGL	DIYYKAFKIT	DRIWIVPERY
sp P10845 BXA1_CLOBO	.PFVNKQFNY	KDPVNGVDIA	YIKIPNVG.Q	MQPVKAFKIH	NKIWVIPERD
sp Q45894 BXA2_CLOBO	.PFVNKQFNY	KDPVNGVDIA	YIKIPNAG.Q	MQPVKAFKIH	NKIWVIPERD
tr Q58GH1 Q58GH1_CLOBO	MPFVNKQFNY	KDPVNGVDIA	YIKIPNAG.Q	MQPVKAFKIH	NKIWVIPERD
tr Q3LRX8 Q3LRX8_CLOBO	MPLVNQQINY	YDPVNGVDIA	YIKIPNAG.K	MQPVKAFKIH	NKVWVIPERD

sp P04958 TETX_CLOTE	EFGTKPE.DF	NPPSSLIEGA	SEYYDPNYLR	TDSKDRLFQ	TMVKLFNRIK
sp P10845 BXA1_CLOBO	TFTNPEEGDL	NPPPEAKQVP	VSYYDSTYLS	TDNEKDNYLK	GVTKLFERIY
sp Q45894 BXA2_CLOBO	TFTNPEEGDL	NPPPEAKQVP	VSYYDSTYLS	TDNEKDNYLK	GVTKLFERIY
tr Q58GH1 Q58GH1_CLOBO	TFTNPEEGDL	NPPPEAKQVP	VSYYDSTYLS	TDNEKDNYLK	GVTKLFERIY
tr Q3LRX8 Q3LRX8_CLOBO	IFTNPEEVDL	NPPPEAKQVP	ISYYDSAYLS	TDNEKDNYLK	GVIKLFERIY

sp P04958 TETX_CLOTE	NNVAGEALLD	KIINAIPYLG	NSYSLLDKFD	TNSNSVSFNL	LEQDPSGATT
sp P10845 BXA1_CLOBO	STD LGRM LLT	SIVRGIPFWG	GSTIDTELKV	IDTNCINVIQ	PDG.....S
sp Q45894 BXA2_CLOBO	STD LGRM LLT	SIVRGIPFWG	GSTIDTELKV	IDTNCINVIQ	PDG.....S
tr Q58GH1 Q58GH1_CLOBO	STD LGRM LLT	SIVRGIPFWG	GSTIDTELKV	IDTNCINVIQ	PDG.....S
tr Q3LRX8 Q3LRX8_CLOBO	STD LGRM LLI	SIVRGIPFWG	GGKIDTELKV	IDTNCINIIQ	LDD.....S

sp P04958 TETX_CLOTE	KSAMLTNLII	FGPGPVLNKN	EVRGIVLRVD	NKNYFPCRDG	FGSIMQMAFC
sp P10845 BXA1_CLOBO	YRSEELNLVI	IGPSADIIQF	ECKSFGHEVL	N....LTRNG	YGSTQYIRFS
sp Q45894 BXA2_CLOBO	YRSEELNLVI	IGPSADIIQF	ECKSFGHDVL	N....LTRNG	YGSTQYIRFS
tr Q58GH1 Q58GH1_CLOBO	YRSEELNLVI	IGPSADIIQF	ECKSFGHDVL	N....LTRNG	YGSTQYIRFS
tr Q3LRX8 Q3LRX8_CLOBO	YRSEELNLAI	IGPSANIIES	QCSSFRRDDVL	N....LTRNG	YGSTQYIRFS

sp P04958 TETX_CLOTE	PEYVPTFDNV	IENITSLTIG	KSKYFQDPAL	LLMHELIVHL	HGLYGMQVSS
sp P10845 BXA1_CLOBO	PDFTFGFEEs	LEVDTNPLL G	AGKFATDPAV	TLAHELIIHAG	HRLYGIAINP
sp Q45894 BXA2_CLOBO	PDFTFGFEEs	LEVDTNPLL G	AGKFATDPAV	TLAHELIIHAE	HRLYGIAINP
tr Q58GH1 Q58GH1_CLOBO	PDFTFGFEEs	LEVDTNPLL G	AGKFATDPAV	TLAHELIIHAE	HRLYGIAINP
tr Q3LRX8 Q3LRX8_CLOBO	PDFTVGFEEs	LEVDTNPLL G	AGKFAQDPAV	ALAHელიHAE	HRLYGIAINT

sp P04958 TETX_CLOTE	HEIIPSKQEI	YMQHT.YPIS	AEELFTFGGQ	DANLISIDIK	NDLYEKT LND
sp P10845 BXA1_CLOBO	NRVFKVNTNA	YYEMSGLEVS	FEELRTFGGH	DAKFIDSLQE	NEFRLYYYNK
sp Q45894 BXA2_CLOBO	NRVFKVNTNA	YYEMSGLEVS	FEELRTFGGH	DAKFIDSLQE	NEFRLYYYNK
tr Q58GH1 Q58GH1_CLOBO	NRVFKVNTNA	YYEMSGLEVS	FEELRTFGGH	DAKFIDSLQE	NEFRLYYYNK
tr Q3LRX8 Q3LRX8_CLOBO	NRVFKVNTNA	YYEMAGLEVS	LEELITFGGN	DAKFIDSLQK	KEFSLYYYNK

sp P04958 TETX_CLOTE	YKAIANKLSQ	VTSCNDPNID	IDSYKQIYQQ	KYQFDKDSNG	QYIVNEDKFQ
sp P10845 BXA1_CLOBO	FKDIASTLNK	AKSIVGTTAS	LQYMKNVFKE	KYLLSEDTS G	KFSVDK LKFD

sp	Q45894	BXA2_CLOBO	FKDVASTLNK	AKSIIGTTAS	LQYMKNVFKE	KYLLSEDTS	KFSVDKLKFD
tr	Q58GH1	Q58GH1_CLOBO	FKDVASTLNK	AKSIIGTTAS	LQYMKNVFKE	KYLLSEDTS	KFSVDKLKFD
tr	Q3LRX8	Q3LRX8_CLOBO	FKDIASSTLNK	AKSIVGTTAS	LQYMKNVFKE	KYLLSEDATG	KFLVDRDLKFD

sp	P04958	TETX_CLOTE	ILYNSIMYGF	TEIELGKKFN	IKTRLSYFSM	NHDPVKIPNL	LDDTIYNDTE
sp	P10845	BXA1_CLOBO	KLYKMLTEIY	TEDNFVKFFK	VLNRKTYLNF	DKAVFKIN.I	VPKVNYTIYD
sp	Q45894	BXA2_CLOBO	KLYKMLTEIY	TEDNFVNFFK	VINRKTYLNF	DKAVFRIN.I	VPDENYTIKD
tr	Q58GH1	Q58GH1_CLOBO	KLYKMLTEIY	TEDNFVNFFK	VINRKTYLNF	DKAVFRIN.I	VPDENYTIKD
tr	Q3LRX8	Q3LRX8_CLOBO	ELYKLLTEIY	TEDNFVKFFK	VLNRKTYLNF	DKAVFKIN.I	VPDVNYTIHD

sp	P04958	TETX_CLOTE	GFNIESKDLK	SEYKGQNMV	NTNAFRNVD.	GSGLVSKLIG	LCKKIIPPTN
sp	P10845	BXA1_CLOBO	GFNLRNNTLA	ANFNGQNTTEI	NNMNFTKLKN	FTGLFEFYKL	LCVRGIITSK
sp	Q45894	BXA2_CLOBO	GFNLKGANLS	TNFNGQNTTEI	NSRNFTRLKN	FTGLFEFYKL	LCVRGIIPFK
tr	Q58GH1	Q58GH1_CLOBO	GFNLKGANLS	TNFNGQNTTEI	NSRNFTRLKN	FTGLFEFYKL	LCVRGIIPFK
tr	Q3LRX8	Q3LRX8_CLOBO	GFNLRNNTLA	ANFNGQNIEI	NNKNFDKLKN	FTGLFEFYKL	LCVRGIITSK

sp	P04958	TETX_CLOTE	IRENLNRTA	SLTDLGGELC	IKIKNEDLTF	IAEKNSFSEE	PFQDEIVSYN
sp	P10845	BXA1_CLOBO	TKSLDKGYNK	ALN...DLC	IKVNNWDLFF	SPSEDNFTND	LNKGEEITS
sp	Q45894	BXA2_CLOBO	TKSLDEGYNK	ALN...DLC	IKVNNWDLFF	SPSEDNFTND	LDKVEEITAD
tr	Q58GH1	Q58GH1_CLOBO	TKSLDEGYNK	ALN...DLC	IKVNNWDLFF	SPSEDNFTND	LDKVEEITAD
tr	Q3LRX8	Q3LRX8_CLOBO	TKSLDEGYNK	ALN...ELC	IKVNNWDLFF	SPSEDNFTND	LDKVEEITS

sp	P04958	TETX_CLOTE	TKNKPLNFNY	SLDKIIVDYN	LQSKITLPND	RTP...VTK	GIPYAPEYKS
sp	P10845	BXA1_CLOBO	TNIEAAEENI	SLDLIQYYL	TFNFDNEPEN	ISIEENLSSDI	IGQLELMPNI
sp	Q45894	BXA2_CLOBO	TNIEAAEENI	SLDLIQYYL	TFDFDNEPEN	ISIEENLSSDI	IGQLEPMPNI
tr	Q58GH1	Q58GH1_CLOBO	TNIEAAEENI	SLDLIQYYL	TFDFDNEPEN	ISIEENLSSDI	IGQLEPMPNI
tr	Q3LRX8	Q3LRX8_CLOBO	TNIEAAEENI	SLDLIQYYL	NFNFDNEPEN	TSIEENLSSDI	IGQLEPMPNI

sp	P04958	TETX_CLOTE	NAASTIEIHN	IDDNTIYQYL	YAQKSPTTLQ	RITMTNSVDD	ALINSTKIYS
sp	P10845	BXA1_CLOBO	ERFPNGKKYE	LDKYTMFHYL	RAQFEHGS	RIALTNSVNE	ALLNPSRVYT
sp	Q45894	BXA2_CLOBO	ERFPNGKKYE	LDKYTMFHYL	RAQFEHGS	RIILTNSAEE	ALLKPNVAYT
tr	Q58GH1	Q58GH1_CLOBO	ERFPNGKKYE	LDKYTMFHYL	RAQFEHGS	RIILTNSAEE	ALLKPNVAYT
tr	Q3LRX8	Q3LRX8_CLOBO	ERFPNGKKYE	LNKYTMFHYL	RAQFEKHSNS	RIILTNSAKE	ALLKPNIVYT

sp	P04958	TETX_CLOTE	YFPS.VISKV	NQGAQGILFL	QWVRDIIDDF	TNESSQKTTI	DKISDVSTIV
sp	P10845	BXA1_CLOBO	FFSSDYVKKV	NKATEAAMFL	GWVEQLVYDF	TDETSEVSTT	DKIADITIII
sp	Q45894	BXA2_CLOBO	FFSSKYVKKI	NKAVEAFMFL	NWAEELVYDF	TDETNEVTM	DKIADITIV
tr	Q58GH1	Q58GH1_CLOBO	FFSSKYVKKI	NKAVEAFMFL	NWAEELVYDF	TDETNEVTM	DKIADITIV
tr	Q3LRX8	Q3LRX8_CLOBO	FFSSKYIKAI	NKAVEAVTFV	NWIENLVYDF	TDETNEVSTM	DKIADITIVI

sp	P04958	TETX_CLOTE	PYIGPALNIV	KQGYEGNFIG	ALETTGVVLL	LEYIPEITLP	VIAALSIAES
sp	P10845	BXA1_CLOBO	PYIGPALNIG	NMLYKDDFVG	ALIFSGAVIL	LEFIPEIAIP	VLGTFALVSY
sp	Q45894	BXA2_CLOBO	PYIGPALNIG	NMLSKGEFVE	AIIFTGVVAM	LEFIPEYALP	VFGTFAIVSY
tr	Q58GH1	Q58GH1_CLOBO	PYIGPALNIG	NMLSKGEFVE	AIIFTGVVAM	LEFIPEYALP	VFGTFAIVSY
tr	Q3LRX8	Q3LRX8_CLOBO	PYIGPALNIG	NMIYKGEFVE	AIIFSGAVIL	LEIVPEIALP	VLGTFALVSY

sp	P04958	TETX_CLOTE	STQKEKIIKT	IDNFLEKRYE	KWIEVYKLVK	AKWLGTVNTQ	FQKRSYQMYR
sp	P10845	BXA1_CLOBO	IANKVLTVQT	IDNALSQRNE	KWDEVYKYIV	TNWLAKVNTQ	IDLIRKKMKE
sp	Q45894	BXA2_CLOBO	IANKVLTVQT	INNALSQRNE	KWDEVYKYTV	TNWLAKVNTQ	IDLIREKMKK
tr	Q58GH1	Q58GH1_CLOBO	IANKVLTVQT	INNALSQRNE	KWDEVYKYTV	TNWLAKVNTQ	IDLIREKMKK
tr	Q3LRX8	Q3LRX8_CLOBO	VSNKVLTVQT	IDNALSQRNE	KWDEVYKYIV	TNWLAIVNTQ	INLIREKMKK

sp	P04958	TETX_CLOTE	SLEYQVDAIK	KIIDYEYKIY	SGPDKEQIAD	EINNLKKNLE	EKANKAMINI
sp	P10845	BXA1_CLOBO	ALENQAEATK	AIINYQYNQY	TEEEKNNINF	NIDDLSSKLN	ESINKAMINI
sp	Q45894	BXA2_CLOBO	ALENQAEATK	AIINYQYNQY	TEEEKNNINF	NIDDLSSKLN	ESINSAMINI
tr	Q58GH1	Q58GH1_CLOBO	ALENQAEATK	AIINYQYNQY	TEEEKNNINF	NIDDLSSKLN	ESINSAMINI
tr	Q3LRX8	Q3LRX8_CLOBO	ALENQAEATK	AIINYQYNQY	TEEEKNNINF	NIDDLSSKLN	ESINSAMINI

sp	P04958	TETX_CLOTE	NIFMRESSRS	FLVNQMINEA	KKQLLEFDTQ	SKNILMQYIK	ANSKFIGITE
sp	P10845	BXA1_CLOBO	NKFLNQCSVS	YLMNSMIPYG	VKRLEDFDAS	LKDALLKYIY	DN.RGTLIGQ
sp	Q45894	BXA2_CLOBO	NKFLDQCSVS	YLMNSMIPYA	VKRLKDFDAS	VRDVLLKYIY	DN.RGTLVLQ
tr	Q58GH1	Q58GH1_CLOBO	NKFLDQCSVS	YLMNSMIPYA	VKRLKDFDAS	VRDVLLKYIY	DN.RGTLVLQ
tr	Q3LRX8	Q3LRX8_CLOBO	NKFLDQCSVS	YLMNSMIPYA	VKRLKDFDAS	VRDVLLKYIY	DN.RGTLIGQ

sp	P04958	TETX_CLOTE	LKKLESKINK	VFSTPIPFYS	SKNLD..CWV	DNEEDIDVIL	KKSTILNLDI
sp	P10845	BXA1_CLOBO	VDRLKDKVNN	TLSTDIPFQL	SKYVDNQRL	STFTEYIKNI	INTSILNLRY
sp	Q45894	BXA2_CLOBO	VDRLKDEVNN	TLSADIPFQL	SKYVDNKKLL	STFTEYIKNI	VNTSILSIVY
tr	Q58GH1	Q58GH1_CLOBO	VDRLKDEVNN	TLSADIPFQL	SKYVDNKKLL	STFTEYIKNI	VNTSILSIVY
tr	Q3LRX8	Q3LRX8_CLOBO	VNRLKDKVNN	TLSADIPFQL	SKYVDNKKLL	STFTEYIKNI	TNASILSIVY

sp	P04958	TETX_CLOTE	NNDIISDISG	FNSSVITYPD	AQLVPGINGK	AIHLVNNES	EVIVHKAMDI
sp	P10845	BXA1_CLOBO	ESNHLIDLSR	YA.SKINIGS	KVNFDPIDKN	QIQLFNLESS	KIEVILKNAI
sp	Q45894	BXA2_CLOBO	KKDDLIDLSR	YG.AKINIGD	RVYYDSIDKN	QIKLINLESS	TIEVILKNAI
tr	Q58GH1	Q58GH1_CLOBO	KKDDLIDLSR	YG.AKINIGD	RVYYDSIDKN	QIKLINLESS	TIEVILKNAI
tr	Q3LRX8	Q3LRX8_CLOBO	KKDDLIDLSR	YG.AEIYNGD	KVYYNSIDKN	QIRLINLESS	TIEVILKNAI

sp	P04958	TETX_CLOTE	EYNDMFNNFT	VSFWLRVPKV	SASHLEQYGT	NEYSIISSMK	KHLSISGSGW
sp	P10845	BXA1_CLOBO	VYNSMYENFS	TSFWIRIPKY	FN...SISLN	NEYTIINCME	NN....SGW
sp	Q45894	BXA2_CLOBO	VYNSMYENFS	TSFWIKIPKY	FS...KINLN	NEYTIINCIE	NN....SGW
tr	Q58GH1	Q58GH1_CLOBO	VYNSMYENFS	TSFWIKIPKY	FS...KINLN	NEYTIINCIE	NN....SGW
tr	Q3LRX8	Q3LRX8_CLOBO	VYNSMYENFS	TSFWIRIPKY	FN...SISLN	NEYTIINCME	NN....SGW

sp	P04958	TETX_CLOTE	SVSLKGNNLI	WTLKDSAGEV	RQITFRDLPD	KFNAYLANKW	VFITITNDRL
sp	P10845	BXA1_CLOBO	KVSLNYGEII	WTLQDTQEIK	QRVVFYKYSQM	INISDYINRW	IFVTITNNRL
sp	Q45894	BXA2_CLOBO	KVSLNYGEII	WTLQDNKQNI	QRVVFYKYSQM	VNISDYINRW	IFVTITNNRL
tr	Q58GH1	Q58GH1_CLOBO	KVSLNYGEII	WTLQDNKQNI	QRVVFYKYSQM	VNISDYINRW	IFVTITNNRL
tr	Q3LRX8	Q3LRX8_CLOBO	KVSLNYGEII	WTFQDTQEIK	QRVVFYKYSQM	INISDYINRW	IFVTITNNRI

sp	P04958	TETX_CLOTE	SSANLYINGV	LMGSAEITGL	GAIREDNNT	LKLDRCNNNN	QYVSIDKFRI
sp	P10845	BXA1_CLOBO	NNSKIYINGR	LIDQKPISNL	GNIHASNNIM	FKLDGCRDTH	RYIWIYFNL
sp	Q45894	BXA2_CLOBO	TKSKIYINGR	LIDQKPISNL	GNIHASNKIM	FKLDGCRDPR	RYIMIYFNL
tr	Q58GH1	Q58GH1_CLOBO	TKSKIYINGR	LIDQKPISNL	GNIHASNKIM	FKLDGCRDPR	RYIMIYFNL
tr	Q3LRX8	Q3LRX8_CLOBO	TKSKIYINGR	LIDQKPISNL	GNIHASNKIM	FKLDGCRDPH	RYIVIKYFNL

sp	P04958	TETX_CLOTE	FCKALNPKEI	EKLYTSYLSI	TFLRDFWGNP	LRYDTEYYLI	PVASSSK..D
sp	P10845	BXA1_CLOBO	FDKELNEKEI	KDLYDNQSNS	GILKDFWGDY	LQYDKPYMYL	NLYDPNKYVD
sp	Q45894	BXA2_CLOBO	FDKELNEKEI	KDLYDSQSNS	GILKDFWGNY	LQYDKPYMYL	NLYDPNKYVD
tr	Q58GH1	Q58GH1_CLOBO	FDKELNEKEI	KDLYDSQSNS	GILKDFWGNY	LQYDKPYMYL	NLYDPNKYVD
tr	Q3LRX8	Q3LRX8_CLOBO	FDKELSEKEI	KDLYDNQSNS	GILKDFWGDY	LQYDKSYMYL	NLYDPNKYVD

sp	P04958	TETX_CLOTE	VQLKNITDYM	YLTNAPSITN	GKLNIIYRRL	YNGLKFIKR	YTPNNEIDSF
sp	P10845	BXA1_CLOBO	VNNVGIRGYM	YKKGPRGSVM	TTNIYLNSSL	YRGTKFIIKK	YASGN.KDNI
sp	Q45894	BXA2_CLOBO	VNNIGIRGYM	YKKGPRGSV	TTNIYLNSTL	YEGTKFIIKK	YASGN.EDNI

tr	Q58GH1	Q58GH1_CLOBO	VNNIGIRGYM	YKKGPRGSVV	TTNIYLNSTL	YEGTKFIIKK	YASGN.EDNI
tr	Q3LRX8	Q3LRX8_CLOBO	VNNVGIRGYM	YKKGPRDNVM	TTNIYLNSSL	YMGTKFIIKK	YASGN.KDNI
sp	P04958	TETX_CLOTE	VKSGDFIKLY	VSYNNEHIV	GYPKDGNAFN	NLDRILRVGY	NAPGIPLYKK
sp	P10845	BXA1_CLOBO	VRNNDRVYIN	VVVKNKEYRL	ATNASQAGVE	KILSALEIPD	VGN..LSQVV
sp	Q45894	BXA2_CLOBO	VRNNDRVYIN	VVVKNKEYRL	ATNASQAGVE	KILSALEIPD	VGN..LSQVV
tr	Q58GH1	Q58GH1_CLOBO	VRNNDRVYIN	VVVKNKEYRL	ATNASQAGVE	KILSALEIPD	VGN..LSQVV
tr	Q3LRX8	Q3LRX8_CLOBO	VRNNDRVYIN	VVVKNKEYRL	ATNASQAGVE	KILSALEIPD	VGN..LSQVV
sp	P04958	TETX_CLOTE	MEAVKLRLDK	TYSVQLKLYD	DKNASLGLVG	THNGQIGNDP	NRDILIASNW
sp	P10845	BXA1_CLOBO	VMKSKNDQGI	TNKCKMNLQD	NNGNDIGFIG	FH....QFN	NIAKLVASNW
sp	Q45894	BXA2_CLOBO	VMKSKDDQGI	RNKCKMNLQD	NNGNDIGFIG	FH....LYD	NIAKLVASNW
tr	Q58GH1	Q58GH1_CLOBO	VMKSKDDQGI	RNKCKMNLQD	NNGNDIGFIG	FH....LYD	NIAKLVASNW
tr	Q3LRX8	Q3LRX8_CLOBO	VMKSKNDQGI	TNKCKMNLQD	NNGNDIGFIG	FH....QFN	NIAKLVASNW
sp	P04958	TETX_CLOTE	YFNHLK..DK	ILGCDWYFVP	TDEGWTND..		
sp	P10845	BXA1_CLOBO	YNRQIERSSR	TLGCSWEFIP	VDDGWERPL		
sp	Q45894	BXA2_CLOBO	YNRQVGKASR	TFGCSWEFIP	VDDGWGESSL		
tr	Q58GH1	Q58GH1_CLOBO	YNRQVGKASR	TFGCSWEFIP	VDDGWGESSL		
tr	Q3LRX8	Q3LRX8_CLOBO	YNRQIERSSR	TLGCSWEFIP	VDDGWRERPL		

CLUSTAL FORMAT for T-COFFEE Version_1.37, CPU=0.26 sec, SCORE=16750, Nseq=2, Len=134

```

unk|VIRT1624|Blast_submission -PITINNFRYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYEF
tr|Q7B8V4|Q7B8V4_CLOBO      MPFVNKQFNYKDPVNGVDIAYIKIPNA-GQMOPVKAFKIHNKIWVIPERDTFT
      *: . :*: .*****. * : : * . *          ***** :*: :*: *

unk|VIRT1624|Blast_submission NPPSSLIEGASEYYDPNYLRDSDKDRFLQTMVKLFNRIKNNVAGEALLDKII
tr|Q7B8V4|Q7B8V4_CLOBO      NPPPEAKQVPVSYDSTYLSTDNEKDNLYKGVTKLFERIYSTDLGRMLLTSIV
      ***.. : . .***..** **.:*: :*: :*: :*: :* .. * . ** .*:

unk|VIRT1624|Blast_submission NSYSLLDKFDTSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGPVLNKNEVR
tr|Q7B8V4|Q7B8V4_CLOBO      GS-----TIDTELKVIDTNCINVIQPDGSYRSEEL-NLVIIGPSADIIQFECK
      .*          .:***: : :. * : :          ...: :* * ***:***.. : : * :

unk|VIRT1624|Blast_submission NKNYFPCRDFGFSIMQMAFCPEYVPTFDNVIENTISLTIGKSKYFQDPALLLM
tr|Q7B8V4|Q7B8V4_CLOBO      NLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLLGAAGKFATDPAVTLA
      * .          *:***: : *.***:.. *: : : * . : * .*: :***: *

unk|VIRT1624|Blast_submission HGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGDANLISIDIKNDL
tr|Q7B8V4|Q7B8V4_CLOBO      HRLYGIAINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEF
      * ***: :...::: : : * : :          :* *** *****:***:*. :*:

unk|VIRT1624|Blast_submission YKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVNEDKFQILY
tr|Q7B8V4|Q7B8V4_CLOBO      FKDIASLTNKAKSIVGTTASLQYMKNVFKEKYLLSEDTSGKFSVDKLFKFDKLY
      :* ***..*...* ... ..: :*: :*: :*: :*: :*: :*: :*: :*: :*

unk|VIRT1624|Blast_submission TEIELGKKFNKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIESKDLKSEY
tr|Q7B8V4|Q7B8V4_CLOBO      TEDNFVKFFKVLNRKTYLNFDAVKFI-NIVPKVNYTIYDGFNLNNTNLAANF
      ** : : * *: : . * :*: :*: : .** *: : .. * . :***:...: * : :

unk|VIRT1624|Blast_submission NTNAF---RNVDGSGLVSKLIGLCKKIIPTNIRENLYNRTASLTDLGELCI
tr|Q7B8V4|Q7B8V4_CLOBO      NNMNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN-----DLCI
      *. * :*. * . ** : : * . * : : :***: . :***

unk|VIRT1624|Blast_submission TFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY-----NLQSKI
tr|Q7B8V4|Q7B8V4_CLOBO      FFSPSEDNFTNDLNKGEEITSDTNIEAAEENISLDLIQQYYLTFNFDNEPENI
      * ..*:***: :*. : :*: :. : * *** * * * * .*:

unk|VIRT1624|Blast_submission TPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQRITMTNSV
tr|Q7B8V4|Q7B8V4_CLOBO      SDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEHGKSRIALTNSV
      : : : * : : . . : :*: . *:*** ** : ***:****

unk|VIRT1624|Blast_submission TKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNNESSQKTTIDKISDVST
tr|Q7B8V4|Q7B8V4_CLOBO      SRVYTFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVSTTDKIADITI
      :*:***:*. * :.***:..: :** **..: :***:***: :* ***:***:

unk|VIRT1624|Blast_submission ALNIVKQGYEGNFIGALETGTVLLEIYIPEITLPVIAALSIAESSTQKEKII
tr|Q7B8V4|Q7B8V4_CLOBO      ALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANKVLTV
      ***** : *. :*:***: :*. :*:***:*****:***:..:..: :* :

unk|VIRT1624|Blast_submission EKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDAIKKIIDYEYK
tr|Q7B8V4|Q7B8V4_CLOBO      SKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATKAIINYQYN
      .** *** ***** : :*:..*****: : * .:*** *.:* * ***:***:

unk|VIRT1624|Blast_submission EQIADEINNKNKLEEKANKAMININIFMRESSRSFLVNQMINEAKKQLLEFD
tr|Q7B8V4|Q7B8V4_CLOBO      NNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVKRLEDFD
      :.* :*:***:..***: . ***** *..: * *:***:*** . *: * **

unk|VIRT1624|Blast_submission MQYIKANSKFIGITELKKLESKINKVFSTPIPFSSYKNLDCWVDNEEDIDVIL
tr|Q7B8V4|Q7B8V4_CLOBO      LKYIYDNRGTL-IGQVDRLLDKVNNLTSTDIPFQLSK----YVDNQRLSTFT

```

```

::** * : * ::.:*:.*:*.:.:** ** :***:. :...:

unk|VIRT1624|Blast_submission KSTILNLDINNDIISDISGFNSSVITYPDQLVPGINGKAIHLVNNESEVIV
tr|Q7B8V4|Q7B8V4_CLOBO NTSILNLRYESNHLIDLSRYASKINIGSKVNFDP-IDKNQIQLFNLESSKIEV
:::**** :. : *:* : *:. :...: * *: : *:*.* ***: : *

unk|VIRT1624|Blast_submission YNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHLSLSIGSGWSVSL
tr|Q7B8V4|Q7B8V4_CLOBO YNSMYENFSTSFWRIPKYFNSISL---NNEYTIINCMENN-----SGWKVSL
**.*:.*:.*:.*:.*:* * .***:***.*:..: ***.***

unk|VIRT1624|Blast_submission TLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRLLSSANLYINGVLMGS
tr|Q7B8V4|Q7B8V4_CLOBO TLQDTQEIKQRVVFKEYSQMINISDYINRWIFVTITNNRLNNSKIYINGRLIDQ
**:*: :...*: : *:*:*:****:*...:**** *...

unk|VIRT1624|Blast_submission AIREDNNITLKLDRCNNNNQYVSIDKFRIFCKALNPKEIEKLYTSYLSITFLR
tr|Q7B8V4|Q7B8V4_CLOBO NIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQSNNGILK
*:.*** :*** *...:.*: *.*:* * ** ***:.*. . :*:

unk|VIRT1624|Blast_submission RYDTEYYLIPVASSSKDVQLKN--ITDYMYLTNAPSYTNGKLNIIYRR-LYNG
tr|Q7B8V4|Q7B8V4_CLOBO QYDKPYMYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIYLNSSLYRG
:*. **:: : ...* *:::* * * .***** :.* : . *** . **.*

unk|VIRT1624|Blast_submission YTPNNEIDSFVKSGDFIKLYVSYNNEHIVGYPKDGNAFNNDRLRVGYNAP
tr|Q7B8V4|Q7B8V4_CLOBO YASGNK-DNIVRNNDRVYINVVVKNKEYRLATNASQAGVEKILSALEI----P
*...*: *.*:..* : : * :*:*: :. . :...: *.: *

unk|VIRT1624|Blast_submission MEAVKLRLDK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNRDILIASNWY
tr|Q7B8V4|Q7B8V4_CLOBO VVVMKSKNDQGITNKCKMNLQDNNNGNDIGFIGFHQF-----NNIAKLVASNW
: .:* :: : * . :*: * *:. :*:*: * *: * . :...:

unk|VIRT1624|Blast_submission KDKILGCDWYFVPTDEGWTND--
tr|Q7B8V4|Q7B8V4_CLOBO SSRTLGCSEFIPVDDGWERPL
..: ***.* *:*.*:*:

```

tr Q7B8V4
Q7B8V4_CLOBO

BoNT/A (Neurotoxin BoNT) [bont/a] [Clostridium botulinum]

Score = 649 bits (1674), Expect = 0.0

Identities = 438/1339 (32%), Positives = 683/1339 (50%), Gaps = 77/1339 (5%)

Query: 1 PITINNFYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYI
P F Y D P V N I + + P + K A F K I + + I W + + P E R F T P E D

Sbjct: 2 PFV NKQFNYKDPVNGVDIAYIKIPNAGQM QPV-KAFKIHNKIWVIPERD

Query: 59 NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGE,
N P P + Y Y D Y L T D + + K D + L + + K L F R I + G L L I + I P + G

Sbjct: 60 NPPPEAKQVPVSYDSTYLSTDNEKDNYLKGVTKLFERIYSTDLGRM

Query: 119 NSY--SLLDKFDTNSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGPA
S + L D T N N + + + D S + + N L + I G P + + E +

Sbjct: 120 GSTIDTELKVIDTNC----INVIQPDGSYRSEE----LNLVIIGPSADIIQFEC

Query: 177 VDNKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENTISLTIGKSKYI
V N R + G + G S + F P + + F + + E T + + G K + D P A + L H E L I H

Sbjct: 172 VLNLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLL GAGKFATC

Query: 237 VLHGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLIS
H L Y G + + + + Y + + + S E E L T F G G D A I + N +

Sbjct: 228 AGHRLYGI AINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFI

Query: 296 NDYKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIV

N +K IA+ L++ S + K +++++KY +D++G++ V++ KF LY +

Sbjct: 288 NKFKDIASTLNKAKSIVGTTASLQYMKNVFKKEYLLSEDTSGKFSVDI

Query: 356 GFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIES

+TE KF + R +Y + + KI N++ Y +GFN+ + +L + + GQN

Sbjct: 348 IYTEDNFVKFFKVLNRKTYLNFDKAVFKI-NIVPKVNYTIYDGFNLRNT

Query: 416 RVNTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDL

+N F +N G KL++ I T + YN+ + +LCIK+ N

Sbjct: 407 EINNMNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN-----

Query: 473 DLTFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY-----NL

DL F +++F+ + + E ++ +T + N SLD I Y N I++ N

Sbjct: 461 DLFFSPSEDNFTNDLNLKGEEITSDTNIEAAEENISLDLIQQYYLTFNFI

Query: 527 RTTPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQR

+++ + P + +++D T++ YL AQ+ RI +TNSV++AL+

Sbjct: 520 LSSDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEGHKS

Query: 587 NSTKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDI

N +++Y++F S + KVN+ + +FL WV ++ DFT+E+S+ +T DKI+D++ I+PYI

Sbjct: 578 NPSRVYTFFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVST

Query: 646 GPALNIVKQGYEGNFIGALETGTVLLLEYIPEITLPVIAALSIAESSTI

GPALNI Y+ +F+GAL +G V+LLE+IPEI +PV+ ++ K ++TIDN

Sbjct: 638 GPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANI

Query: 706 FLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDA

L KR EKW EVYK + WL VNTQ +M +LE Q +A +

Sbjct: 698 ALSKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATK

Query: 766 DKEQIADEIXXXXXXXXXXXXXXXXXMININIFMRESSRSFLVNQMINEA

+K I I MININ F+ + S S+L+N MI K+L +FD K+

Sbjct: 758 EKNNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVI

Query: 826 ILMQYIKANSKFIGITELKKLESKINKVFSTPIPFSSYKNLDCWVDNEI

L++YI N +I++ +L+ K+N ST IPF SK +VDN+ + +

Sbjct: 818 ALLKYIYDNRGTL-IGQVDRLKDKVNNTLSTDIPFQLSK----YVDNQRL

Query: 883 --STXXXXXXXXXXXXXXXXXGFNSSVITYPDAQLVPGINGKAIHLVNNE

+T +S I I+ I L N ESS++ V I

Sbjct: 873 IINTSILNLRYESNHLIDLSRYASKINIGSKVNFDPIDKNQIQLFNLESSI

Query: 941 EYNDMFNNFTVSWFLRVPKVSASHLEQYGTNEYSIISSMKKHSLSI

YN M+ NF+ SFW+R+PK S NEY+II+ M+ + SGW VSL +I

Sbjct: 933 VYNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWK

Query: 1001 WTLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRLSSANLY

WTL+D+ +++ F+ + N+W+F+TITN+RL+++ +YING L+ I+ L

Sbjct: 985 WTLQDTQEIKQRVVFYKYSQMINISDYINRWIFVTITNNRLNNSKIYING

Query: 1061 GAIREDDNNITLKLDRCNNNNQYVSIDKFRIFCKALNPKEIEKLYTSYI

G I NNI KLD C + ++Y+ I F +F K LN KEI+ LY + + L+DFWG+

Sbjct: 1045 GNIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQ

Query: 1121 LRYDTEYYLIPVASSSKDVQLKN--ITDYMyltnapsyTNGKLNIYYF

L+YD YY++ + +K V + N I YMYL P + NIY LY G KFIK

Sbjct: 1105 LQYDKPYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIY

Query: 1178 RYTPNNEIDSFVKSGDFIKLYVSYNNNEHIVGYPKDGNafN-NLDR

+Y N+ D+ V++ D + + V N E Y NA +++IL P +

Sbjct: 1164 KYASGNK-DNIVRNNDRVYINVVKNKE----YRLATNASQAGVEKILS

Query: 1237 KKMEAVKLRLDK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNF

++ +K ++ + T ++ L D+ +G +G H Q N L+ASNWY ++

Sbjct: 1218 SQVVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH--QFNNIK---

Query: 1295 --DKILGCDWYFVPTDEGW 1311

+ LGC W F+P D+GW

Sbjct: 1273 RSSRTLGCSEFIPVDDGW 1291

sp P10845
BXA1_CLOBO

Botulinum neurotoxin type A precursor (EC 3.4.24.69) (BoNT/A)
(Bontoxilysin A) (BOTOX) [Contains: Botulinum neurotoxin
A light-chain; Botulinum neurotoxin A heavy-chain] [botA]
[Clostridium botulinum]

Identities = 438/1339 (32%), Positives = 683/1339 (50%), Gaps = 77/1339 (5%)

Query: 1 PITINNFYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYI
P F Y D P V N I + + P + K A F K I + + I W + + P E R F T P E D

Sbjct: 1 PFV NKQFNYKDPVNGVDIAYIKIPNVGQM QPV-KAFKIHNKIWVIPERD

Query: 59 NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGE,
N P P + Y Y D Y L T D + + K D + L + + K L F R I + G L L I + I P + G

Sbjct: 59 NPPPEAKQVPVSYYDSTYLSTDNEKDNYLKGVTKLFERIYSTDLGRM

Query: 119 NSY--SLLDKFDTNSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGPI
S + L D T N N + + + D S + + N L + I G P + + E +

Sbjct: 119 GSTIDTELKVIDTNC----INVIQPDGSYRSEE----LNLVIIGPSADIIQFEC

Query: 177 VDNKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENTISLTIGKSKYI
V N R + G + G S + F P + + F + + E T + + G K + D P A + L H E L I H

Sbjct: 171 VLNLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLL GAGKFATC

Query: 237 VLHGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLIS
H L Y G + + + + Y + + + S E E L T F G G D A I + N +

Sbjct: 227 AGHRLYGI AINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFI

Query: 296 NDYKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVI
N + K I A + L + + S + K + + + + K Y + D + + G + + V + + K F L Y +

Sbjct: 287 NKFKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDTS GKFSVDI

Query: 356 GFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIES
+TE K F + R +Y + + K I N++ Y +GFN+ + +L + + GQN

Sbjct: 347 IYTEDNFVKFFKVLNRKTYLNFDKAVFKI-NIVPKVNYTIYDGFNLRNT

Query: 416 RVNTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDL
+N F +N G KL+ + I T + YN+ + +LCIK+ N

Sbjct: 406 EINNMFNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN-----

Query: 473 DLTFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY-----NL
DL F +++F+ + + E ++ +T + N SLD I Y N I++ N

Sbjct: 460 DLFFSPSEDNFTNDLNLKGEEITSDTNIEAAEENISLDLIQQYYLTFNFI

Query: 527 RTTPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQR
++ + + P + + + +D T++ YL AQ+ RI +TNSV++AL+

Sbjct: 519 LSSDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEGHKSRR

Query: 587 NSTKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDI
N +++Y++F S + KVN+ + +FL WV ++ DFT+E+S+ +T DKI+D++ I+PYI

Sbjct: 577 NPSRVYTFFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVST

Query: 646 GPALNIVKQGYEGNFIGALETTGVVLLLEYIPEITLPVIAALSIAESSTG
GPALNI Y+ +F+GAL +G V+LLE+IPEI +PV+ ++ K ++TIDN

Sbjct: 637 GPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANI

Query: 706 FLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDA
L KR EKW EVYK + WL VNTQ +M +LE Q +A +

Sbjct: 697 ALSKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATK

Query: 766 DKEQIADEIXXXXXXXXXXXXXXXXXMININIFMRESSRSFLVNQMINEA
+K I I MININ F+ + S S+L+N MI K+L +FD K+

Sbjct: 757 EKNNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGV

Query: 826 ILMQYIKANSKFIGITELKKLESKINKVFSTPIPFSSYKNLDCWVDNEI
L++YI N +I++ +L+ K+N ST IPF SK +VDN+ + +

Sbjct: 817 ALLKYIYDNRGTL-IGQVDRLKDKVNNTLSTDIPFQLSK----YVDNQRL

Query: 883 --STXXXXXXXXXXXXXXXXXGFNSSVITYPDAQLVPGINGKAIHLVNNE
+T +S I I+ I L N ESS++ V I

Sbjct: 872 IINTSILNLRYESNHLIDLSRYASKINIGSKVNFDPIDKNQIQLFNLESSI

Query: 941 EYNDMFNNFTVSWFLRVPKVSASHLEQYGTNEYSIISSMKKHLSLSI
YN M+ NF+ SFW+R+PK S NEY+II+ M+ + SGW VSL +I

Sbjct: 932 VYNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWK

Query: 1001 WTLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDR LSSANLY
WTL+D+ +++ F+ + N+W+F+TITN+RL+++ +YING L+ I+ L

Sbjct: 984 WTLQDTQEIKQRVVF KYSQMINISDYINRWIFVTITNNRLNNSKIYING

Query: 1061 GAIREDDNNITLKLDRCNNNNQYVSIDKFRIFCKALNPKEIEKLYTSYI
G I NNI KLD C + ++Y+ I F +F K LN KEI+ LY + + L+DFWG+

Sbjct: 1044 GNIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQ

Query: 1121 LRYDTEYYLIPVASSSKDVQLKN--ITDYMYLTNAPSYTNGKLNIYYF
L+YD YY+++ +K V + N I YMYL P + NIY LY G KFIK

Sbjct: 1104 LQYDKPYMYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIY

Query: 1178 RYTPNNEIDSFVKSGDFIKLYVSYNNNEHIVGYPKDGNAFN-NLDR
+Y N+ D+ V++ D++ V N E Y NA +++IL P +

Sbjct: 1163 KYASGNK-DNIVRNNDRVYINVVVKNKE----YRLATNASQAGVEKILS

Query: 1237 KKMEAVKLRDLK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNF
++ +K+++ T ++LD+ +G+GH Q N L+ASNWY ++

Sbjct: 1217 SQVVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH--QFNNTAK---

Query: 1295 --DKILGCDWYFVPTDEGW 1311

+ LGC W F+P D+GW

Sbjct: 1272 RSSRTLGCSEFIPVDDGW 1290

tr Q7B8V4 BoNT/A (Neurotoxin BoNT) [bont/a] [Clostridium
Q7B8V4_CLOBO botulinum]

Score = 649 bits (1674), Expect = 0.0

Identities = 438/1339 (32%), Positives = 683/1339 (50%), Gaps = 77

```

Query: 1   PITINNFYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYEFGTKP
          P   F Y DPVN   I  ++ P   +   KAFKI ++IW++PER  F T P
Sbjct: 2   PFVVKQFNYKDPVNGVDIAYIKIPNAGQMGPV-KAFKIHNKIWVIPERDTF-TNP

Query: 59  NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGEALLDKIINA
          NPP   +   YYD  YL TD++KD +L+ + KLF RI +   G  LL  I+
Sbjct: 60  NPPPEAKQVPVSYDSTYLSTDNEKDNYLKGVTCLFERIYSTDLGRMLLTSIVRG

Query: 119 NSY--SLLDKFDTNSNSVSFNLLEQDPSGATTKSAMLTNLIIFGPGPVLNKNEVR
          S   + L   DTN      N+++ D S   + +   NL+I GP   + + E +
Sbjct: 120 GSTIDTELKVIDTNC----INVIQPDGSYRSEE----LNLVIIGPSADIIQFECK

Query: 177 VDNKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENITSLTIGKSKYFQDPALLM
          V N      R+G+GS   + F P++   F+  +E  T+  +G  K+  DPA+ L
Sbjct: 172 VLNLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLLGAGKFATDPAVTLA

Query: 237 VLHGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLISIDIKNDL
          H LYG+ ++ + +   Y + +   +S EEL TFGG DA  I   +N+
Sbjct: 228 AGHRLYGIAINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEF

Query: 296 NDYKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVNEDKFQILY
          N +K IA+ L++  S      +   K ++++KY   +D++G++ V++ KF  LY
Sbjct: 288 NKFKDIASTLNKAKSIVGTASLQYMKNVFKEKYLLSEDTSGKFSVDKLFKFDKLY

Query: 356 GFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIESKDLKSEY
          +TE   K F +  R +Y + +   KI N++   Y   +GFN+ + +L + +
Sbjct: 348 IYTEDNFVKFFKVLNRKTYLNFDAVFKI-NIVPKVNYTIYDGFNLRNTNLAANF

Query: 416 RVNTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDLGELCI
          +N   F   +N  G   KL+ +   I   T   +  YN+   +   +LCI
Sbjct: 407 EINNMFNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN-----DLCI

Query: 473 DLTFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY-----NLQSKI
          DL F   +++F+ +   + E ++ +T +   N SLD I   Y   N   I
Sbjct: 461 DLFFSPSEDNFTNDLNKGEEITSDTNIEAAEENISLDLIQYYLTFNFDNEPENI

Query: 527 RTTPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQRITMTNSV
          ++ +   +   P   +   + + +D  T++ YL AQ+   RI +TNSV
Sbjct: 520 LSSDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEHGKSRIALTNSV

Query: 587 NSTKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNNESSQKTTIDKISDVST

```

Sbjct: 578 N +++Y++F S + KVN+ + +FL WV ++ DFT+E+S+ +T DKI+D++
NPSRVYTFSSDYVKKVKNKATEAAMFLGWVEQLVYDFTDETSEVSTTDKIADITI

Query: 646 GPALNIVKQGYEGNFIGALETGTVLLLEYIPEITLPVIAALSIAESSTQKEKII
GPALNI Y+ +F+GAL +G V+LLE+IPEI +PV+ ++ K +

Sbjct: 638 GPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANKVLTV

Query: 706 FLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDAXXXXXXXXXXX
L KR EKW EVYK + WL VNTQ +M +LE Q +A

Sbjct: 698 ALSKRNEKWDEVYKYIVTNWLAKVNTQIDLRKKMKEALENQAEATKAIINYQYN

Query: 766 DKEQIADEIXXXXXXXXXXXXXXXXXMININIFMRESSRSFLVNQMINEAKKQLEFD
+K I I MININ F+ + S S+L+N MI K+L +FD

Sbjct: 758 EKNNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVKRLEDFD

Query: 826 ILMQYIKANSKFIGITELKKLESKINKVFSTPIPFSSKNLDCWVDNEEDIDVIL
L++YI N + I ++ +L+ K+N ST IPF SK +VDN+ +

Sbjct: 818 ALLKYIYDNRGTL-IGQVDRDKDKVNNTLSTDIPFQLSK----YVDNQRLSTFT

Query: 883 --STXXXXXXXXXXXXXXXXXGFNSSVITYPDAQLVPGINGKAIHLVNNESEVIVH
+T +S I I+ I L N ESS++ V

Sbjct: 873 IINTSILNLRYESNHLIDL SRYASKINIGSKVNFDPIDKNQIQLFNLESSKIEVI

Query: 941 EYNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHSLSIGSGWSVSLK
YN M+ NF+ SFW+R+PK S NEY+II+ M+ + SGW VSL

Sbjct: 933 VYNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWKVSLN

Query: 1001 WTLKDSAGEVRQITFRDLDPKFNAYLANKWVFITITNDR LSSANLYINGVLMGSA
WTL+D+ +++ F+ + N+W+F+TITN+RL+++ +YING L+

Sbjct: 985 WTLQDTQEIKQRRVVFYKYSQMINISDYINRWIFVTITNNRLNNSKIYINGRLIDQK

Query: 1061 GAIREDDNNITLKLDRCNNNNQYVSDKFRIFCKALNPKEIEKLYTSYLSITFLRD
G I NNI KLD C + ++Y+ I F +F K LN KEI+ LY + + L+D

Sbjct: 1045 GNIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQSN SGILKD

Query: 1121 LRYDTEYYLIPVASSSKDVQLKN--ITDYMILTNPASYTNGKLNIIYR-RLYNGL
L+YD YY++ + +K V + N I YMYL P + NIY LY G

Sbjct: 1105 LQYDKPYMYMLNLYDPNKYVDVNVGIRGYMYL-KGPRGSVMTTNIYLNSSLYRGT

Query: 1178 RYTPNNEIDSFVKSGDFIKLYVSYNNEHIVGYPKDGNAFN-NLDRILRVGYNAP
+Y N+ D+ V++ D + + V N E Y NA +++IL P

Sbjct: 1164 KYASGNK-DNIVRNDRVYINVVVKNKE---YRLATNASQAGVEKILS-ALEIP

Query: 1237 KKMEAVKLRLDK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNRDILIASNWW
++ +K ++ + T ++ L D+ +G +G H Q N L+ASNWW

Sbjct: 1218 SQVVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH--QFNNAK---LVAASNWW

Query: 1295 --DKILGCDWYFVPTDEGW 1311
 + LGC W F+P D+GW
 Sbjct: 1273 RSSRTLGCSEWFIPVDDGW 1291

sp P10845 Botulinum neurotoxin type A precursor (EC 3.4.24.69)
 BXA1_CLOBO (BoNT/A)
 (Bontoxilysin A) (BOTOX) [Contains: Botulinum
 neurotoxin
 A light-chain; Botulinum neurotoxin A heavy-chain]
 [botA]
 [Clostridium botulinum]

Score = 649 bits (1673), Expect = 0.0
 Identities = 438/1339 (32%), Positives = 683/1339 (50%), Gaps = 77

Query: 1 PITINNFRYSDPVNNDTIIMMEPPYCKGLDIYYKAFKITDRIWIVPERYEFGTKP
 P F Y DPVN I ++ P + KAFKI ++IW++PER F T P
 Sbjct: 1 PFVNKQFNYKDPVNGVDIAYIKIPNVGQMOPV-KAFKIHNKIWVIPERDTF-TNP

Query: 59 NPPSSLIEGASEYYDPNYLRTDSDKDRFLQTMVKLFNRIKNNVAGEALLDKIINA
 NPP + YYD YL TD++KD +L+ + KLF RI + G LL I+
 Sbjct: 59 NPPPEAKQVPVSYDSTYLSTDNEKDNLYLKGVTKLFERIYSTDLGRMLLSIVRG

Query: 119 NSY--SLLDKFDTNSNSVSFNLEQDPSGATTKSAMLTNLIIFGPGPVLNKNEVR
 S + L DTN N+++ D S + + NL+I GP + + E +
 Sbjct: 119 GSTIDTELKVIDTNC----INVIQPDGSYRSEE----LNLVIIGPSADIIQFECK

Query: 177 VDNKNYFPCRDGFGSIMQMAFCPEYVPTFDNVIENTISLTIGKSKYFQDPALLM
 V N R+G+GS + F P++ F+ +E T+ +G K+ DPA+ L
 Sbjct: 171 VLNLT----RNGYGSTQYIRFSPDFTFGFEESLEVDTNPLLGAGKFATDPAVTLA

Query: 237 VLHGLYGMQVSSHEIIPSKQEIYMQHT-YPISAEELFTFGGQDANLISIDIKNDL
 H LYG+ ++ + + Y + + +S EEL TFGG DA I +N+
 Sbjct: 227 AGHRLYGIAINPNRVFKVNTNAYYEMSGLEVSFEELRTFGGHDAKFIDSLQENEF

Query: 296 NDYKAIANKLSQVTSCNDPNIDIDSYKQIYQQKYQFDKDSNGQYIVNEDKFKQILY
 N +K IA+ L++ S + K ++++KY +D++G++ V++ KF LY
 Sbjct: 287 NKFKDIASTLNKAKSIVGTTASLQYMKNVFKEKYLLSEDTSGKFSVDKLFKFDKLY

Query: 356 GFTEIELGKKFNIKTRLSYFSMNHDPVKIPNLLDDTIYNDTEGFNIESKDLKSEY
 +TE K F + R +Y + + KI N++ Y +GFN+ + +L + +
 Sbjct: 347 IYTEDNFVKFFKVLNRKTYLNFDAVFKI-NIVPKVNYTIYDGFNLRNTNLAANF

Query: 416 RVNTNAF---RNVDGSGLVSKLIGLCKKIIPPTNIRENLYNRTASLTDLGCELCI
 +N F +N G KL+ + I T + YN+ + +LCI
 Sbjct: 406 EINNMNFTKLKNFTGLFEFYKLLCVRGIITSKTKSLDKGYNKALN-----DLCI

Query: 473 DLTFIAEKNSFSEEPFQDEIVSYNTKNKPLNFNYSLDKIIVDY-----NLQSKI
DL F +++F+ + + E ++ +T + N SLD I Y N I
Sbjct: 460 DLFFSPSEDNFTNDLNLKGEEITSDTNIEAAEENISLDLIQQYYLTFTNFDNEPENI

Query: 527 RTTPVTKGIPYAPEYKSNAASTIEIHNIDDNTIYQYLYAQKSPTTLQRITMTNSV
++ + + P + + + +D T++ YL AQ+ RI +TNSV
Sbjct: 519 LSSDIIGQLELMPNIERFPNG--KKYELDKYTMFHYLRAQEFEGKSRIALTNSV

Query: 587 NSTKIYSYFPS-VISKVNQGAQGILFLQWVRDIIDDFTNESSQKTTIDKISDVST
N +++Y++F S + KVN+ + +FL WV ++ DFT+E+S+ +T DKI+D++
Sbjct: 577 NPSRVYTFSSDYVKKVNKATEAAMFLGWVEQLVYDFTDETSEVSTTDKIADITI

Query: 646 GPALNIVKQGYEGNFIGALETGTVLLLEYIPEITLPVIAALSIAESSTQKEKII
GPALNI Y+ +F+GAL +G V+LLE+IPEI +PV+ ++ K +
Sbjct: 637 GPALNIGNMLYKDDFVGALIFSGAVILLEFIPEIAIPVLGTFALVSYIANKVLTV

Query: 706 FLEKRYEKWIEVYKLVKAKWLGTVNTQFQKRSYQMYRSLEYQVDAXXXXXXXXXXX
L KR EKW EVYK + WL VNTQ +M +LE Q +A
Sbjct: 697 ALSKRNEKWDEVYKYIVTNWLAKVNTQIDLIRKKMKEALENQAEATKAIINYQYN

Query: 766 DKEQIADEIXXXXXXXXXXXXXXXXXMININIFMRESSRSFLVNQMINEAKKQLLEFD
+K I I MININ F+ + S S+L+N MI K+L +FD
Sbjct: 757 EKNNINFNIDDLSSKLNESINKAMININKFLNQCSVSYLMNSMIPYGVKRLEDFD

Query: 826 ILMQYIKANSKFIGITELKKLESKINKVFSTPIPFSSYKNLDCWVDNEEDIDVIL
L++YI N + I ++ +L+ K+N ST IPF SK +VDN+ +
Sbjct: 817 ALLKYIYDNRGTL-IGQVDRCLKDKVNNTLSTDIPFQLSK---YVDNQRLSTFT

Query: 883 --STXXXXXXXXXXXXXXXXXGFNSSVITYPDAQLVPGINGKAIHLVNNESEVIVH
+T +S I I+ I L N ESS++ V
Sbjct: 872 IINTSILNLRYESNHLIDLSRYASKINIGSKVNFDPIDKNQIQLFNLESSKIEVI

Query: 941 EYNDMFNNFTVSFWLRVPKVSASHLEQYGTNEYSIISSMKKHSLSIGSGWSVSLK
YN M+ NF+ SFW+R+PK S NEY+II+ M+ + SGW VSL
Sbjct: 932 VYNSMYENFSTSFWIRIPKYFNSISL---NNEYTIINCMENN-----SGWKVSLN

Query: 1001 WTLKDSAGEVRQITFRDLPDKFNAYLANKWVFITITNDRLSSANLYINGVLMGSA
WTL+D+ +++ F+ + N+W+F+TITN+RL+++ +YING L+
Sbjct: 984 WTLQDTQEIKQRVVFYKYSQMINISDYINRWIFVTITNNRLNNSKIYINGRLIDQK

Query: 1061 GAIREDDNNITLKLDRCNNNQYVSIDKFRIFCKALNPKEIEKLYTSYLSITFLRD
G I NNI KLD C + ++Y+ I F +F K LN KEI+ LY + + L+D
Sbjct: 1044 GNIHASNNIMFKLDGCRDTHRYIWIKYFNLFDKELNEKEIKDLYDNQSN SGILKD

Query: 1121 LRYDTEYYLIPVASSSKDVQLKN--ITDYMILTNAPSYTNGLKLNIIYYR-RLYNGL
L+YD YY++ + +K V + N I YMYL P + NIY LY G

Sbjct: 1104 LQYDKPYMYMLNLYDPNKYVDVNNVGIRGYMYL-KGPRGSVMTTNIYLNSSLYRGT

Query: 1178 RYTPNNEIDSFVKSGDFIKLYVSNNNEHIVGYPKDGNAFN-NLDRILRVGYNAP
+Y N+ D+ V++ D + + V N E Y NA +++IL P

Sbjct: 1163 KYASGNK-DNIVRNNDRVYINVVVKNKE---YRLATNASQAGVEKILS-ALEIP

Query: 1237 KKMEAVKLRLDK--TYSVQLKLYDDKNASLGLVGTHNGQIGNDPNRDILIASNWY
++ +K ++ + T ++ L D+ +G +G H Q N L+ASNWY

Sbjct: 1217 SQVVVMKSKNDQGITNKCKMNLQDNNGNDIGFIGFH--QFNNTIAK---LVASNWY

Query: 1295 --DKILGCDWYFVPTDEGW 1311
+ LGC W F+P D+GW

Sbjct: 1272 RSSRTLGCSEFIPVDDGW 1290